RMW 74217

PRELIMINARY REPORT ON THE DISTRIBUTION AND ABUNDANCE OF SEALS IN THE AUSTRALASIAN REGION

1. SCOPE OF THE REPORT

This report summarizes both historical and recent data on the distribution and status of seals in Australia's and New Zealand's territorial waters . Its geographical scope is therefore limited to the coastline of Australia, Tasmania and adjacent islands; New Zealand, Antipodes I., Auckland Is., Bounty Is., Campbell I., Chatham Is., Snares Is., Solander I. and Stewart I. Although Macquarie I. is an Australian territory under the direct jurisdiction of Tasmania, it is geographically and biologically part of New Zealand's sub-antarctic group, and I have treated it as such.

This report also includes a brief summary of european exploitation of seals in the region; data on the biology and population dynamics of each species, where these are available; food, feeding and effects on fisheries; references to recent and on-going research, and a comment on aesthetics.

Sources of information include published material, museum records, unpublished data from research workers, the files of various government agencies concerned with wildlife and fisheries, professional fishermen, and my own field observations. My review of the literature is by no means complete, and is especially meagre as far as precise historical records are concerned. This is due largely to the uncertainty of interpreting early accounts of fur seals in southeastern Australian waters according to current species concepts. However where sites are currently occupied I have assumed conspecificity of historial and recent (post 1945) records, unless there is evidence to the contrary. I have for the most part accepted author's identification of species.

Data on distribution (see appendices) have been grouped by locality, in alphabetic listing for each territorial entity e.g. New Zealand and its associated islands (including Macquarie I.), and separately for each Australian State.

The status of each existing colony has been defined in terms of the most recent estimate of numbers, if one is available, and whether breeding is known to occur, probably occurs, does not occur, or the matter is uncertain. The source of these data is cited in each instance. For some of the more important and better known sealing grounds I have been able to include data on the initial haul of skins, to give some idea of the original abundance of the resource.

2. SPECIES

Five species are resident within the region: two fur seals, two sea lions and the southern elephant seal. The nomenclature followed here is basically that of King (1964), modified according to the review of Australian fur seals by King (1969) and of the genus *Arctocephalus* by Repenning, Peterson and Hubbs (1971).

Family OTARIIDAE

Arctocephalus pusillus doriferus (Wood Jones) 1925

Type locality unknown, Nominate race *Arctocephalus pusillus pusillus* (Schreber)1776.

Type locality, Cape of Good Hope, South Africa.

Arctocephalus forsteri (Lesson) 1828
Type locality, Dusky Sound, New Zealand.

Neophoca cinerea (Peron) 1816.
Type locality, Kangaroo I., South Australia.

Phocarctos hookeri (Gray) 1844
Type locality, Auckland Is., New Zealand.

Family PHOCIDAE

Mirounga leonina (Linnaeus) 1758
Type locality, Masa Afuera I.

The antarctic species *Hydrurga leptonyx, Lobodon carcinophaga* and *Leptonychotes weddelli* have been recorded as stragglers to New Zealand and southern Australia. Records of *Hydrurga* are typically of winter incidence and are sufficiently frequent and regular to suggest that an extensive northward movement is normal for the species.

3. HISTORICAL BACKGROUND

All five species were subjected to a long period of exploitation by europeans for skins and oil. The pelt of *A. forsteri* was considered to be the most valuable of the two fur seals and often both species were killed merely for the skin (Dunderdale, c. 1895). The pelts of sea lions were much less valuable and their bodies were often rendered down for oil. Elephant seals were important only as a source of oil.

Historically this exploitation occurred in three phases:

Phase I consisted of an intense and unregulated industry, which was associated with the colonization and early economic development of Australia (Hainsworth, 1972). The initial effort was concentrated in Bass Strait and along the southern Australian coast, but the industry soon spread to New Zealand (Dunbabin, 1931). Initially seal products found ready markets in China and then in Europe, and the trade which developed was the first export industry of the colony at Sydney (Hainsworth, 1972; Abbott and Nairn, 1969).

In addition to colonial enterprise the sealing grounds were also worked by English, French and American gangs. The intense competition which developed and the rapid dwindling of the seal colonies forced wider ranging by the sealing captains and eventually led to the discovery of the rich grounds beyond New Zealand and in the sub-antarctic. By 1825 all the significant and accessible colonies had been reduced to very low levels or eliminated entirely. Sealing as a primary activity then virtually ceased.

Phase II was generally associated with expanding settlement and involved only local enterprise. Residual colonies were persistently exploited along with other species of wildlife, or in association with agricultural activities near to seal colonies. This phase continued into the latter half of last century, both in Australia and New Zealand, and was eventually brought to a close or under some form of regulation by government action. This is the theme of the third or current phase.

In 1875 the New Zealand Government moved to prohibit sealing during the months October to May. This restriction remained in force until 1894, when sealing was totally prohibited. In 1913 a three month season was reintroduced, in which it was legal to take seals under regulation. Licenses were not required and no check was made on the numbers taken each year to 1916, when the season was again closed. An exception was made in the case of the Campbell Island Co. (an agricultural concern) which was permitted to take up to 400 fur seal skins in 1922

and 1924, however this quota was not reached in either year and no further permits were granted.

In 1946 the New Zealand Government declared an open season in response to pressures by local fishing interests. It was of four months duration and was restricted to parts of the south coast of the South I. of New Zealand, Solander I. and parts of Stewart I. The conditions of the license were such that, in effect, they were available only to commercial fishermen. The total yield was 6187 skins, mostly of females and pups (Sorensen 1969b).

The corresponding period in Australia, where each State is quite independent in the administration of its wildlife, has not yet been fully researched. In Western Australia seals have been legally protected since 1892, but at least one open season has been permitted since then, in 1920. In that year a sealing party took 494 *A. forsteri* and 327 *N. cinerea* in the Recherche Archipelago (Serventy 1953).

In Victorian waters (to 39°12'S) seals were given legal protection in 1890, and only once since then has a season been declared, in 1948-1949. As in New Zealand in 1946, this was in response to complaints by the local fishing industry . Permits were available only to licensed fishermen, who were required to forward all carcases to Melbourne for processing. Despite vociferous complaint against the seals only 619 were accounted for (McNally and Lynch, 1954). As far as I am aware seals have not been taken elsewhere in Australia for commercial purposes or control for at least 50 years.

It is clear, from even the most cursory examination of historical accounts and recent data, that the initial reduction of the breeding stocks of all five species was disastrous and that recovery has been extremely slow. In the case of the fur seals this may have been due, in part at least, to sporadic harvesting despite low economic return (Phase II, and to some extent in Phase III) and, more recently, to illegal "control" shooting by fishermen (Sorenson 1969a, files of the Victorian Fisheries and Wildlife Division) which is impossible to prevent in open waters.

4. CURRENT DISTRIBUTION AND STATUS

Arctocephalus pusillus doriferus

The present range extends from Seal Rocks, New South Wales, to southern Tasmania and throughout Bass Strait to as far west as Lady Julia Percy I., i.e. from 32°28' to 43°51'S and from 152°33' to 142°00'E. On present evidence the breeding range does not include the east and south coasts of Tasmania, but it is likely that breeding does occur at some of the known sites there. More detailed and appropriately timed field surveys are required to improve estimates of colony size and status.

A summation of the most recent estimates gives a total of about 20,000 for the whole region, of which more than two thirds is concentrated at three sites in Bass Strait: Judgment Rocks, Seal Rocks off Phillip I. and Lady Julia Percy I.

Historical records do not reveal a wider distribution in the past, and the uncertainty of much of these data do not permit any estimate of original abundance. The lack of colonization or re-colonization of the many vacant sites within its present range suggests that most of these may have originally been occupied by *A. forsteri*. It is also possible that the existing breeding colonies represent the major foci of the species prior to european colonization.

There is some suggestion that slight redistribution in relation to other species may have occurred, e.g. *A. p. doriferus* now occurs in the Anser Group, said to have once been occupied by hair seals (Doome, 1874), but no real evidence now exists.

Arctocephalus forsteri

The Australian and New Zealand populations are apparently geographically isolated, and may have been long before european activity in the region (see Shaughnessy, 1970). The species in Australia is by no means common although it is widely distributed from about 117° to 136° E, with occasional stragglers penetrating Bass Strait to about 145° E. Information on individual colonies (post 1945) is so meagre that no satisfactory estimate of total numbers can be made. It may be as low as several thousand.

Historical evidence indicates that its range formerly extended to the Furneaux Group in eastern Bass Strait, and that it was quite abundant there. However as there is no evidence at all that the species is significantly increasing in numbers anywhere in Australian waters, it seems unlikely that these vacant sites will be recolonized in the forseeable future.

The situation in New Zealand is in strong contrast. According to various authors (see Crawley 1972) *A. forsteri* is increasing throughout its range there. There is reasonable evidence of an upward trend in numbers at many breeding sites in the past two decades and there has also been a marked increase in numbers hauling out at non-breeding sites to the north (Kaikoura, Wellington, Three Kings Is.) and south (Macquarie I.) of the present range. Breeding has actually commenced at Macquarie I. but as yet the number of pups born is still very small (Johnstone, 1972). Viewed against historical records of the species' former abundance to the east of the Tasman Sea, the current population estimate of about 40,000 (Wilson 1974b) indicates that there is great scope for further expansion of present colonies, and especially those on the remote islands.

Neophoca cinerea

Although this sea lion is the most widely distributed of Australian seals, from Houtmann's Abrolhos (28°S) to Kangaroo I. (138°E) it is nowhere abundant. The uncertainty or lack of estimates of colony size appears to be a reflection of the isolation of many of the islands it inhabits, and of a far less tenacious fixation to site compared with *Arctocephalus*. I have the impression that it has a natural tendency to congregate only in relatively small numbers at any one site, for there are few records of colonies in excess of 100 or 200. This is certainly true of recent records and appears to have been the case prior to exploitation by europeans. (see Flinders, 1814 (1) : 91).

Allowing the most generous interpretation of recent (post 1945) estimates of individual colonies the total population would appear to be within the range of 2000 - 3000, which is near the lowest estimate given by Scheffer (1958 : 3).

Phocarctos hookeri

The main population is centred on several of the small islands of the Auckland Group, rather than on the main island itself, but it is by no means abundant. Best (1974) estimates that there are about

1000 on Enderby I., 2000 on Dundas I. and 68 were counted on Figure of Eight 1. A few haul-out at various points throughout the Group, so that the total for the Group as a whole would be of the order 3000 - 3500 (Wilson, pers. comm.).

Some breeding occurs at Campbell I. and at the Snares, but those islands are predominantly male hauling grounds. A small group of males has been noted at Stewart I., but most other records are of lone individuals, all males. The northern limits of this ranging by males is about 46°S, to the Otago Peninsula in the South I., and south to 53°S at Macquarie I. where several known individuals have visited regularly during a period of years until fully mature.

It would appear then, that the entire population would be of the order of 4000.

Historical records do not indicate a wider breeding range or any clear indication of its former abundance. There is some evidence (e.g. Musgrave, 1865) that *Phocarctos* will vacate a breeding site if subjected to undue disturbance by Man (cf. *Neophoca*, Marlow, 1968) so that counts at selected sites over a period of years may give an erroneous idea of population trends.

Mirounga leonina

The main focus of this species in the Australasian Region is Macquarie I., with a small but thriving colony at Campbell I. There is clear evidence (Johnstone, 1972) that the former colony is now at its maximum sustainable level, at about 95000 not including pups of the year. The most recent counts for Campbell I. indicate a breeding population of at least 300 females and a larger number of males, mostly immature.

Early last century a major breeding colony of unknown size existed on the N and E coasts of King I. in Bass Strait and on nearby islets, but it was quickly eliminated as a breeding species.

The species ranges widely and regularly visits Antipodes Is., Auckland Is., and the Snares. In recent times stragglers have been recorded at the Chathams and South I. of New Zealand and in Australian waters at Tasmania, several islands in Bass Strait, and on the Victorian coast. Both heavily pregnant females and fully mature males are involved, and this suggests the possibility of eventual recolonization of more northern sites, if not in New Zealand waters where opportunities are limited, at least in western Bass Strait.

5. BIOLOGY AND POPULATION DYNAMICS

Arctocephalus pusillus doriferus

Breeding habitat varies from basalt reef and shore platforms of low elevation, caves, boulder stacks and marginally on cobblestone beach, smooth granite ledges and slopes.

The colony at Seal Rocks, Victoria, which has been studied extensively for some years, breeds during November-December. Males are rigidly territorial and polygamous but harems are not formed. The ratio of males to females is 1 : 8-10.

Parous females copulate 6 days after parturition, but implantation is delayed until the following March-April. Pups are normally suckled for 11-12 months, but a few are carried through a second year, and in

rare instances through a third. This may happen if the subsequent pup is lost soon after birth.

Females reach puberty at 4 years or later, occasionally at 3. Males probably reach puberty at 4 or 5 years, but attainment of breeding status is deferred until a competitive size is reached, possibly by the tenth year but probably later.

As yet there is little quantitative data on mortality in relation to age or sex. Counts of dead pups in the breeding areas reveal a minimum loss of the order of 15 percent in the first two months, when they are sedentary and do not readily enter the sea. During the later period of immaturity many more die at sea, and an analysis of tag returns indicates that a significant proportion of these losses are due to fishermen, through accidental drowning in nets and traps, and by shooting. Large sharks, and the white pointer (*Carcharodon carcharias*) in particular, prey heavily on seals of all ages, but the extent of this mortality is unknown.

Young seals tagged at Seal Rocks have been found to be rather sedentary, few moving beyond 150 km of the natal colony. Males range more widely than females, to distances of at least 750 km. As yet there is no evidence of interchange of breeding animals between colonies.

The two largest breeding colonies, at Seal Rocks and Lady Julia Percy I., appear to have been stable for at least 30 years and it is likely that some of the very small seal islands are also at saturation e.g. Tenth I. and Moriarty Rocks. Elsewhere there is little convincing evidence of increase in numbers, except at Judgment Rocks.

Arctocephalus forsteri

The favoured breeding habitat of this species appears to be boulder stacks fronting cliffs or slopes of high relief. Wilson (1974a) has coined the term "tumbledown beach" to describe these situations, and has stressed that they provide shelter for females and pups. The species climbs well and retreats to higher situations to avoid breaking seas (e.g. at the Aucklands, Wilson 1974a; and at the South Neptunes, Warneke, pers. obs.).

In broad outline the biology of this species is essentially the same as *A. p. doriferus*, however there are marked behavioural differences and the breeding seasons do not coincide (Stirling and Warneke, 1971). Wilson (1974a) has defined three main types of colony: breeding, bachelor bull and immature. These aggregations may be quite geographically isolated (e.g. wintering colonies of males around the North I. of New Zealand) but, even if all three types are present at the one site, they are still clearly segregated.

Bachelor males are automatically excluded from breeding areas by the territorial behaviour of the dominant males, but the absence of juveniles from these areas during the breeding season is in contrast to the situation with *A. p. doriferus*. At Seal Rocks, Victoria, a significant proportion of immatures of both sexes to age 3 or 4 are to be found among the breeding females, throughout the breeding season.

Although no precise data are available on birth and mortality rates, age at first breeding etc., one attempt has been made to calculate the size of the colony at Taumaka from pup counts, using the known population parameters of *Callorhinus* (Crawley and Brown, 1971). Although several sources of bias could not be allowed for the result was not inconsistent with field estimates.

Neophoca cinerea

The biology of this species has not been closely studied and only a general outline can be given.

In contrast to the fur seals *Neophoca* prefers sandy beaches and smooth rock for breeding purposes, however individual sea lions often haul out among resting fur seals. *Neophoca* has a well marked tendency to penetrate inland and individuals have been found several miles from shore (King, 1964).

Adult males become territorial in September and pupping commences in October, but the timing of these events varies in some years for reasons that are not clear (Marlow, pers. comm.). The areas defended by adult males are not fixed, but alter depending on environmental factors (Stirling 1971) and the presence of females about to give birth (Marlow, 1968). The normal ratio of males to females at breeding sites appears to be 1 : 4-6 (Flinders, 1814; Marlow, 1968; Stirling, 1971).

Copulation occurs 6.5 days after parturition (Marlow, 1968). Pups may suckle for two years or longer and individual females have been observed nursing both a new born pup and a yearling con-currently (Marlow 1968, Stirling 1971).

Limited data on age structure of populations in South Australia (Stirling, 1971) reveals that adults commonly reach nine years, however the limitations of the ageing technique prevented accurate estimation beyond 12 years. On the basis of these data and comparable species of otariids Stirling (1971) suggested that Neophoca females commence breeding at three years in compensation for their limited life expectancy.

No quantitative data are yet available on mortality. As appears to be common in many otariids, a proportion of late term foetuses are lost through abortion (Marlow, 1968) and it is obvious that the species is subject to predation by large sharks (Marlow, 1968). The white pointer (*Carcharodon carcharias*) abounds in sothern Australian waters and is frequently taken in the vicinity of seal rookeries.

Phocarctos hookeri

Only the broad outline of the biology of this species is known, from general accounts (e.g. Musgrave, 1865) and a mass of incidental observations. In some respects its behaviour seems rather similar to that of *Neophoca*, in that it breeds on beaches and often wanders inland. The breeding season is from late October to January; males are territorial and polygamous, the ratio at breeding sites being 1 : 12 (Gaskin, 1972). Pups are born during November-January, and females are mated only a few days after parturition. The period of lactation appears to be 6-8 months, but pups may remain with their mothers for some months after weaning. The activities of the young pups are closely supervised by their mothers.

Mirounga leonina

This species resorts to habitual breeding sites on sandy beaches, which are usually characterized by easy access from the sea. Mature males are ashore from early August to early December. The first mature and pregnant females arrive in September and congregate in small groups. As each group forms it is taken over by the larger males (beachmasters) and later arrivals join these established harems. These aggregations

may eventually contain 600 or more females, which is far more than a single beachmaster can control. Assistant beachmasters are admitted and take over individual sections. Harems of 50 or less never contain more than one breeding bull.

On average a female is present at a breeding site for 28 days (5 days pre-partum and 23 days of lactation) and fasts the whole time. Oestrus occurs in the third week of lactation, or earlier if the pup is lost. During the short period of dependence pups gain weight at a rate of about 5 kg per day.

Carrick and Ingham (1962c) have shown that the breeding population at Macquarie I. is stable at 36,000 females and 3500 - 4000 breeding males, with an annual maximum of the order of 110,000 including pups. Survival of branded, weaned pups to the fourth year of life is over 40 per cent in both sexes; 20 per cent of females survive to the eighth year of life, but few may live longer than 12 years . Fifteen per cent of males survive to the eight year of life, but the small number of breeding males may contain individuals 20 years old. In this unexploited population females do not reach puberty until the third year at the earliest and many do not until the fourth or fifth year. Males are thought to reach puberty at 5 years or older,but attainment of reproductive status is deferred until the twelfth to fourteenth year of life.

Growth and development in the exploited population at South Georgia ($54^{o}30'S$, $36^{o}40'W$) is in striking contrast. South Georgia females generally reach puberty and mate at 2 years and males are mature and present at the breeding season at 4 years of age and may hold harems at 7. The rate of growth of South Georgia elephant seals is significantly greater and both males and females achieve larger size than do Macquarie seals, suggesting that nutritional factors, i.e. competition for food, is limiting in the latter population (see review in Johnstone, 1972).

Of all the Australasian seals *Mirounga* is the only species which could be commercially exploited at the present time on a sustained yield basis.

Carrick and Ingham (1962 c) have considered the feasibility of harvesting the two surpluses that are available as a result of the dynamics of the Macquarie I. population : adult males and weaned pups. Surplus males would have to be taken when they first haul out for breeding or moulting i.e. those times at which they are carrying maximum blubber reserves. At the former time serious disturbance to pregnant and parturient females would probably occur and the taking of the most economically desirable males, the largest and most experienced harem bulls, would reduce reproductive efficiency. The alternatives of selecting younger males at the time of moult did not appear feasible, owing to their less synchronized haul-out habits, and intermixing with other ages and females.

Harvesting of fat weaned pups as they leave the harems appears to be safe, from both the numerical and behavioural viewpoints. Carrick and Ingham argue that, pending experimental evidence, it might be possible to take up to 80 per cent of males and 50 per cent of females without affecting future breeding stocks and success. A likely advantage is an increased food resource available to developing females, enabling them to breed at puberty or even increase their survival rate. Carrick and Ingham stressed that these figures are tentative and may be excessive if the causes of juvenile mortality were not approximately density dependent, and further cautioned that large scale trials would be necessary to determine the most appropriate levels and methods of harvesting.

6. FOOD, FEEDING AND FISHERIES

Arctocephalus pusillus doriferus

This fur seal feeds predominently on squid (*Notodarus*, *Sepioteuthis*) and octopus (*Octopus*), but a wide range of fishes are also eaten depending on seasonal availability and local opportunity (McNally and Lynch, 1954). Of these barracouta (*Thyrsites*), which often occurs in large shoals in Bass Strait in summer, is undoubtedly the most important. Some of the other species that are taken, though not regularly nor apparently in large numbers except under favourable circumstances, are whiting (*Sillaginodes*) flathead (*Platycephalus*) red mullet (*Upeneichthys*) parrot fish (*Pseudolabrus*) leather jackets (*Aluteridae*) and small fry such as pilchards (*Clupeidae*). Crayfish (*Jasus*) are taken from time to time, but possibly only when in the "soft shell" stage. Crabs have been found in the stomachs of starveling juveniles, but not in any healthy active seals.

Recoveries of drowned seals from traps and trawl nets indicate that this species is quite able to hunt at depths of at least 118 m. This suggests that the whole of the Continental Shelf is available as a feeding area.

It is widely maintained by fishermen that seals drastically reduce the stocks of commercially valuable fish, but this claim is not substantiated by evidence from fisheries statistics or the contents of stomachs and ejecta. This fur seal does however pose a problem to sedentary mesh net fisheries in Port Phillip and Westernport Bays in Victoria, which are situated close to the large colony at Seal Rocks. Even though these two bays are not significant feeding areas for seals, lone individuals can do extensive damage to a fleet of nets, and losses are compounded by the escape and/or mauling of enmeshed fish. The problem occurs sporadically and the only effective remedy is prompt destruction of the offending seal. Line fishing for barracouta can also be disrupted by seals, but it appears to be a problem only in seasons of short supply.

Arctocephalus forsteri

Data from stomach contents (Rapson in Sorenson 1969b; Street, 1964) indicates that *A. forsteri*, in the vicinity of the South I. of New Zealand, feeds mainly on squid (*Notodarus* and *Sepioteuthis*), octopus (*Octopus*) and barracouta, and not on prime commercial fishes as claimed by fishermen working those waters. Street's analysis showed that barracouta comprised 38 per cent by weight of the diet, with octopus, squid and other fish in the percentages 29, 24 and 9 respectively. Of the variety of other fish identified none were of commercial significance, and it was clear that any commercial fishes taken by seals would be incidental to their main diet.

According to Street, *A. forsteri* feeds principally in near-surface waters (on barracouta and squid) and at night, but takes octopus on the bottom at any time.

In southern waters, off Campbell I., the main diet is penguins and squid (Bailey and Sorensen, 1962).

There are no data on the species' food preferences in Australian waters, but squid, octopus and barracouta are all abundantly available. Mutton birds and presumably other small sea birds are occasionally taken (Warneke, pers. obs.). As far as I am aware *A. forsteri* does not occur in sufficient numbers near fishing grounds in South or Western Australia to be considered a pest.

Neophoca cinerea

Very little has been recorded on the diet and feeding behaviour of this sea lion. Wood Jones (1925) records that Little penguins (*Eudyptula*) are commonly taken by adult males when ashore for the breeding season. Penguins breed on many of the islands inhabited by *Neophoca* and would be easy prey when moving to and from their burrows. They may also be caught at sea. Wood Jones also observed a seal tearing up a large fiddler (*Trygonorhina*) at the surface by gripping it firmly in its teeth and shaking vigorously. This fish is common in the shallow coastal waters of South Australia.

Apart from the general antipathy of fishermen towards seals there appears to be no widespread complaint against sea lions by the industry, probably because it does not occur in large numbers in any one place. Storr (1965) records that sea lions are "disliked" by fishermen netting salmon (*Arripis*) at Cheynes Beach, Western Australia, because they attack the nets to reach the enclosed fish.

Phocarctos hookeri

According to Gaskin (1972) this sea lion feeds mainly on small fish, crustaceans, sea birds and penguins. Waite (1909) found the remains of octopus and fish in one stomach and quoted information to the effect that octopus remains were frequently found in their stomachs.

Visiting sea lions at Macquarie have been observed preying on Gentoo penguins (*Pygoscelis*) and the technique has been described in detail by Gwynn (1953).

Mirounga leonina

The feeding habits of the species in the New Zealand region have not been studied in detail, but fish, cephalopods and small crustaceans appear to be the major items of the diet. Gaskin (1972).

7. RESEARCH AND AESTHETICS

Arctocephalus pusillus doriferus

As a direct result of long controversy over the effects of this species on local fisheries, the Victorian Fisheries and Wildlife Division began a study of its biology at Seal Rocks, off Phillip Island, in 1966. The initial emphasis has been on social and reproductive behaviour, and considerable effort has been devoted to the marking of about two-thirds of the annual crop of pups, to provide a sound basis for later studies on growth, development, reproductive physiology and population structure. Some monthly sampling of limited extent has been carried out and currently the marking program is being broadened to include some other accessible colonies.

The results of this study will provide the basis for any future conservation and management policies.

Apart from its importance to field research the Seal Rocks colony is a rather unique tourist attraction. For many years it has been one of the important wildlife assets of Phillip Is., which is a major tourist outlet for Melbourne, a city of approximately 3 million. Seal Rocks is the only large breeding colony of seals in Australia that may be easily

and safely viewed by the public, either from Pt. Grant, an adjacent headland of Phillip I., or from a ferry which runs out to the colony in good weather during the tourist season. A tourist facility at Pt. Grant provides high powered binoculars for viewing and a free information brochure. The feasibility of closed circuit television viewing of the colony at close range, to improve the scope and detail of the visual experience, is currently under study.

The only other colony of this species which offers scope for tourism is at Lady Julia Perch I., Victoria. Boat parties are occasionally taken out to view the seals from the nearest ports (a distance of about 20 km) but this is not yet a regular service.

Australian fur seals are exhibited in both the Melbourne Zoological Gardens and at Taronga Zoo in Sydney, New South Wales.

Arctocephalus forsteri

The totally inadequate biological basis for the 1946 open season in New Zealand led to field surveys by Falla (Sorensen 1969b; Falla 1953) and recommendations for future studies. An encouraging series of publications have since appeared, covering a modest breadth of topics: feeding habits (Rapson and Sorensen 1969b; Street 1964), the increase in non-breeding colonies to the north (Tunbridge in Sorensen 1969a; Stonehouse, 1965; Stirling, 1970; Singleton, 1972; Wilson 1974b), recolonization of Macquarie I. (Gwynn 1973; Csordas 1958; Csordas and Ingham 1965), diurnal rhythms of activity (Stirling, 1968; Crawley, 1972), social and reproductive behaviour (Miller 1971, 1974; Crawley 1972; Crawley ,Miller and Wilson, in press), vocal communication (Brown 1974), a population estimate from pup counts (Crawley and Brown, 1971), and the distribution and summer abundance throughout New Zealand (Wilson, 1974 a, b).

Current investigations are aimed at determining the magnitude and rate of the increase in numbers of this species throughout its range. (Crawley, pers. comm.).

Research in Australia has been limited to social and reproductive behaviour (Stirling 1971 a, b; Stirling and Warneke, 1971).

I am unable to give any worthwhile assessment of the aesthetics of this species. In Australia it is by no means an accessible animal, and the only colony that can be viewed with comparative ease is hardly known to the public. This is a non-breeding colony near Cape du Couedic, Kangaroo I., a locality that is visited by tourists because of its picturesque lighthouse and rugged rock formations.

Neophoca cinerea

Despite its wide range this species has received little attention from biologists until recent years. Apart from general accounts of its natural history and morphology (e.g. Wood Jones 1925) there have been only brief contributions on reproductive and maternal behaviour (Marlow 1968; Stirling, 1972a) population structure (Stirling, 1972a) and pup abduction (Marlow, 1972).

It is however a most significant species as far as tourism in South Australia is concerned, and its economic value to that state can only increase as tourism expands. This has been clearly shown by conservative estimates of tourist expenditure in relation to the seals at Seal Bay, Kangaroo I. (Stirling, 1972b). A non-breeding population at this locality

has become so accustomed to humans that tourists are able to mingle with the seals on the beach. Conducted tours to Seal Bay began in 1955 and the service has expanded in recent years. Stirling has stressed that management authorities must anticipate future pressures if this important natural resource is not to be lost.

Neophoca is held in captivity at a number of zoos and aquaria in Australia and appears to be a hardy and amiable species in confinement.

Phaearctos hookeri

The restricted distribution of this species and the remoteness of its breeding grounds have rendered it the least known of all the seals in the Australasian Region.

However with the increasing activity in seal research in New Zealand in recent years some preliminary work has been done on distribution, abundance and social and reproductive behaviour at the Auckland Is., and the Snares (Crawley and Cameron, 1972; Best, 1974).

Mirounga leonina

This species has been the subject of long term life history studies by Australian biologists at Macquarie I. since 1951 (Carrick and Ingham, 1960). The main findings, based on individually marked individuals of known age, were published by Carrick et al (1962 a, b); Carrick and Ingham (1962 a, b, c) and Nicholls (1970).

Subsequent studies have been on more specialized physiological topics : on growth and development (Bryden, 1967; 1968 a, b, c, d; 1969 a, b, c; 1971 a, b; 1972, 1973; Bryden and Lim, 1969), and the integument (Ling, 1965, 1966, 1968; Ling and Thomas, 1967).

The remoteness and general inaccessibility of the major breeding and hauling grounds of this species prevents their exploitation as a tourist resource. Captive display is the only alternative and the first attempt with 2 juveniles at the Mount Mauganui Marineland at Hauranga, New Zealand, is proving successful (Gaskin 1972).

8. BIBLIOGRAPHY

ABBOT, G.A. and NAIRN, N.B. (Eds.) (1969)
"Economic Growth of Australia 1788-1821." (Melbourne University Press).

BAILEY, A.M. and SORENSEN, J.H. (1962).
Subantarctic Campbell Island.
Proc. Denver Mus. Nat. Hist. 10 : 305 pp.

BARRETT, J.W. (1918).
"The Twin Ideals". (2 vols.)
(London ,Lewis & Co.).

BEST, H.A. (1974).
A preliminary report on the natural history and behaviour of Hooker's sea-lion at Enderby Island, Auckland Islands, New Zealand, December 1972 to March 1973.
N.Z. Ministry of Agric. and Fisheries, Fisheries Technical Report No. 132. (Wellington).

BROWN, D.L. (1974).
Vocal communication of the New Zealand fur seal on Open Bay Islands, Westland.
N.Z. Ministry of Agric. and Fisheries, Fisheries Technical Report. No. 130. (Wellington).

BRYDEN, M.M. (1967).
Testicular temperature in the southern elephant seal, *Mirounga leonina* (Linn.).
J. Reprod. Fert. 13 : 583-94.

BRYDEN, M.M. (1968a).
Control of growth in two populations of elephant seals.
Nature. 217 : 1106-08.

BRYDEN, M.M. (1968b).
Development and growth of the southern elephant seal (*Mirounga leonina*) (Linn.).
Pap. Proc. Roy. Soc. Tasm. 102 : 25-30.

BRYDEN, M.M. (1968c).
Growth and function of the subcutaneous fat of the elephant seal.
Nature 220 : 597-99.

BRYDEN, M.M. (1968d).
Lactation and suckling in relation to early growth of the southern elephant seal, *Mirounga leonina* (L.).
Aust. J. Zool. 16 : 739-48.

BRYDEN, M.M. (1969a).
Growth of the southern elephant seal, *Mirounga leonina* (Linn.).
Growth. 33 : 69-82.

BRYDEN, M.M. (1969b).
Regulation of relative growth by functional demand : its importance in animal production.
Growth. 33 : 143-156.

BRYDEN, M.M. (1969c).
Relative growth of the major body components of the southern elephant seal, *Mirounga leonina* (L.)
Aust. J. Zool. 17 : 153-77.

BRYDEN, M.M. (1971a).
Size and growth of viscera in the southern elephant seal, *Mirounga leonina* (L.).
Aust. J. Zool. 19 : 103-20.

BRYDEN, M.M. (1971b).
Myology of the southern elephant seal *Mirounga leonina* (L.).
Antarct. Res. Ser. (Am. Geophys. U.) 18 : 109-40.

BRYDEN, M.M. (1972).
Body size and composition of elephant seals (*Mirounga leonina*): absolute measurements and estimates from bone dimensions.
J. Zool. Lond. 167 : 265-76.

BRYDEN, M.M. (1973).
Growth patterns of individual muscles of the elephant seal, *Mirounga leonina* (L.).
J. Anat. 116 : 121-33.

BRYDEN, M.M. and LIM, G.H.K. (1969).
Blood parameters of the southern elephant seal (*Mirounga leonina*, Linn.) in relation to diving.
Comp. Biochem. Physiol. 28 : 139-48.

CARRICK, R. and INGHAM, S.E. (1960).
Ecological studies of the southern elephant seal, *Mirounga leonina* (L.), at Macquarie Island and Heard Island.
Mammalia, 24 : 325-342.

CARRICK, R. and INGHAM, S.E. (1962a).
Studies on the southern elephant seal, *Mirounga leonina* (L.).
I. Introduction to the series.
C.S.I.R.O. Wildl. Res. 7 : 89-101.

CARRICK, R. and INGHAM, S.E. (1962b).
Studies on the southern elephant seal, *Mirounga leonina* (L.).
II. Canine tooth structure in relation to function and age determination.
C.S.I.R.O. Wildl. Res. 7 : 102-18.

CARRICK, R., CSORDAS, S.E., INGHAM, S.E. and KEITH, K. (1962a).
Studies on the southern elephant seal, *Mirounga leonina* (L.).
III. The annual cycle in relation to age and sex.
C.S.I.R.O. Wildl. Res. 7 : 119-60.

CARRICK, R., CSORDAS, S.E. and INGHAM, S.E. (1962b).
Studies on the southern elephant seal, *Mirounga leonina* (L.).
IV. Breeding and development.
C.S.I.R.O. Wildl. Res. 7 : 161-97.

CARRICK, R. and INGHAM, S.E. (1962c).
Studies on the southern elephant seal, *Mirounga leonina* (L.).
V. Population dynamics and utilization.
C.S.I.R.O. Wildl. Res. 7 : 198-206.

CHAPMAN, F.R. (1891).
The outlying islands south of New Zealand.
Trans. N.Z. Inst. 23 : 491-522.

CLARK, J.W. (1873).
On the eared seals of the Auckland Islands.
Proc. Zool. Soc. Lond. 1873 : 750-60.

COLLINS, D. (1802).
"An account of the English colony in New South Wales" vol.2.
(London, Cadell and Davies).

COOPER, H.M. (1953).
"The Unknown Coast".
(Adelaide, the author).

CORNELL, C. (1974).
"The Journal of Post Captain Nicholas Baudin".
(Adelaide, Libraries Board of South Australia).

CRAWLEY, M.C. (1972).
Distribution and abundance of New Zealand fur seals on the Snares Islands, New Zealand.
N.Z. J. Mar. Freshw. Res. 6 : 115-26.

CRAWLEY, M.C. and BROWN, D.L. (1971).
Measurements of tagged pups and a population estimate of New Zealand fur seals on Taumaka, Open Bay Islands, Westland.
N.Z. J. Mar. Freshw. Res. 5 : 389-95.

CRAWLEY, M.C. and CAMERON, D.B. (1972).
New Zealand sea lions, *Phocarctos hookeri*, on the Snares Islands.
N.Z. J. Mar. Freshw. Res. 6 : 127-32.

CRAWLEY, M.C., MILLER, E.H. and WILSON, G.J. (1975).
The natural history and behaviour of the New Zealand fur seal.
Tuatara (in press).

CSORDAS, S.E. (1958).
Breeding of the furseal, *Arctocephalus forsteri* Lesson, at Macquarie Island.
Aust. J. Sci. 21 : 87-88.

CSORDAS, S.E. (1963a).
Sea lions on Macquarie Island.
Vict. Nat. 80 : 32-35.

CSORDAS, S.E. (1962).
The Kerguelen fur seal on Macquarie Island.
Vict. Nat. 79 : 226-29.

CSORDAS, S.E. (1963b).
The history of fur seals on Macquarie Island.
Vict. Nat. 80 : 255-58.

CUMPSTON, J.S. (1963).
"Shipping Arrivals and Departures Sydney, 1788-1825".
(Canberra, the author).

CUMPSTON, J.S. (1968).
"Macquarie Island".
(Canberra, Dept. Ext. Affairs).
ANARE Scientific Reports, Series A
(1) Narrative, Pub. No. 93.

CUMPSTON, J.S. (1973).
"First visitors to Bass Strait".
Roebuck Soc. Pub. No. 7.
(Canberra).

DAVIES, E.L. (Ed.) (1965).
"Atlas of Tasmania".
(Hobart, Lands and Survey Dept.).

DOOME, U. (1874).
A cruise in Bass's Straits.
The Illustrated Sydney News. 28 Feb. 1874.

DRAKE-BROCKMAN, H. (1964).
"Voyage to Disaster. The life of Francisco Pelsaert".
(Sydney, Angus and Robertson).

DUNBABIN, T. (1931).
"Sailing the World's Edge".
(London, Newnes).

DUNDERDALE, G. (c. 1895).
"The Book of the Bush".
(London, Ward Lock).

FALLA, R.A. (1948).
The outlying islands of New Zealand.
N.Z. Geographer 4 : 127-54.

FALLA, R.A. (1953).
Southern seals: population studies and conservation problems.
Proc. 7th Pacific Sci. Congr. 4 : 706.

FLINDERS, M. (1814).
"A voyage to Terra Australis". (2 vols. + atlas).
(London, Nicol).

GASKIN, D.E. (1972).
"Whales Dolphins and Seals with special reference to the New Zealand Region".
(London, Heinemann).

THE GIPPSLAND MERCURY, 2 Feb. 1875.

GOULD, C. (1872).
The islands in Bass's Straits.
Pap. Proc. Roy. Soc. Tasm. 1871 : 57-67.

GRANT, J. (1803).
"The narrative of a voyage of discovery, performed in His Majesty's Vessel The Lady Nelson".
(London, Egerton).

GWYNN, A.M. (1953).
Notes on the fur seals at Macquarie Island and Heard Island.
Aust. Nat. Antarc. Res. Exp.
Interim Report 4. (Melbourne).

HAINSWORTH, D.R. (1972).
"The Sydney Traders".
(Melbourne, Cassell).

JOHNSTONE, G.W. (1972).
A review of biological research by Australian National Artarctic Research Expeditions, 1947-71.
Polar Research 16 : 519-32.

JONES, R. (1967).
Middens and Man in Tasmania.
Aust. Nat. Hist. 15 : 359-64.

KELLY, J. (1920).
First discovery of Port Davey and Macquarie Harbour, by James Kelly.
Pap. Proc. Roy. Soc. Tasm. 1920 : 160-81.

KING, J. (1964).
"Seals of the World".
(London, British Museum (Natural History)).

KING, J.E. (1968).
On the identity of the furseals of Australia.
Nature. 219 : 632-33.

KING, J.E. (1969).
The identity of the fur seals of Australia.
Aust. J. Zool. 17 : 841-53.

KING, P.P. (1828).
"Narrative of a survey of the intertropical and western coasts of Australia performed between the years 1818 and 1822". (2 vols.).
(London, Murray).

LEE, I. (1915).
"The logbooks of the 'Lady Nelson'".
(London, Grafton & Co.).

LE SOUEF, A.S. (1925).
Notes on the seals found in Australian seas.
Aust. Zoologist 4 : 112-16.

LE SOUEF, D. (1891).
Expedition of Field Naturalists' Club to Kent Group, Bass Straits.
Vict. Nat. 7 : 121-31.

LINDGREN, E. (1956).
Bird notes on Lion Island, Esperance.
W. Aust. Nat. 5 : 97-101.

LING, J.K. (1965).
Hair growth and moulting in the southern elephant seal, *Mirounga leonina* (Linn.). *in* "Biology of the Skin and Hair Growth". Eds. A.G. Lyne and B.F. Short. (Sydney, Angus and Robertson).

LING, J.K. (1966).
The skin and hair of the southern elephant seal, *Mirounga leonina* (Linn.).
I. The facial vibrissae.
Aust. J.Zool. 14 : 855-66.

LING, J.K. (1968).
The skin and hair of the southern elephant seal, *Mirounga leonina* (L).
III. Morphology of the adult integument.
Aust. J. Zool. 16 : 629-45.

LING, J.K. and THOMAS, C.D.B. (1967).
The skin and hair of the southern elephant seal, *Mirounga leonina* (L.).
II. Pre-natal and early post-natal development and moulting.
Aust. J. Zool. 15 : 349-65.

MARGINSON, M.A. and MURRAY-SMITH, S. (1972).
Craggy Island, Bass Strait.
Vict. Nat. 89 : 212-22.

MARLOW, B.J. (1968).
The sea-lions of Dangerous Reef.
Aust. Nat. Hist. June 1968 : 39-44.

MARLOW, B.J. (1972).
Pup abduction on the Australian sea lion *Neophoca cinerea*.
Mammalial. 36 : 161-65.

MARLOW, B.J. and KING, J.E. (1974).
Sea lions and fur seals of Australia and New Zealand - the growth of knowledge.
Aust. Mamm. 1 : 117-35.

MACKENZIE, D. (1968).
The birds and seals of the Bishop and Clerk Islets, Macquarie Island.
Emu 67 : 241-45.

MCNAB, R. (1909).
"Murihiku".
(Wellington, Whitcombe & Tombs).

MCNALLY, J. and LYNCH, D.D. (1954).
Notes on the food of Victorian seals.
Fisheries and Game Dept.
Fauna Report 1. (Melbourne).

MICCO, H.M. (1971).
"King Island and the Sealing Trade 1802".
Roebuck Soc. Pub. No. 3. (Canberra).

MILLER, E.H. (1971).
Social and thermoregulatory behaviour of the New Zealand fur seal *Arctocephalus forsteri* (Lesson 1828).
M.Sc. thesis, Dept. of Zoology, University of Canterbury, Christchurch.

MILLER, E.H. (1974).
Social behaviour of the New Zealand fur seal on Open Bay Islands, Westland.
N.Z. Ministry of Agric. and Fisheries, Fisheries Technical Report No. 131. (Wellington).

MORELL, Jnr., B. (1832).
"A narrative of four voyages to the South Sea".
(New York).

MUSGRAVE, T. (1865).
"Castaway on the Auckland Isles".
(Melbourne, Dwight).

NICHOLLS, D.G. (1970).
Dispersal and dispersion in relation to the birthsite of the southern elephant seal, *Mirounga leonina* (L.), of Macquarie Island.
Mammalia, 34 : 598-616.

NIXON, F.R. (1857).
"The Cruise of the Beacon".
(London, Bell and Daldy).

O'LOUGHLIN, P.M. (1967).
Houtmans Abrolhos.
Aust. Nat. Hist. 15 : 413-17.

PERON, F. (1807, 1816).
"Voyage de decouvertes aux Terres Australes". 2 vols.
(Paris).

PLOMLEY, N.J.B. (1966).
"Friendly Mission".
(Tasmanian Hist. Res. Assoc.).

THE PRESS, Christchurch, 27 Jan. 1968.

REDWOOD, R. (1950).
"Forgotten Islands of the South Pacific".
(Wellington, Reed).

REPENNING, C.A., PETERSON, R.S. and HUBBS, C.L. (1971).
Contributions to the systematics of the southern fur seals, with special reference to the Juan Ferdandez and Guadalupe species.
Antarct. Res. Ser. (Am. Geophys. U.) 18 : 1-34.

RICHDALE, L.E. (n.d.)
"Wild Life on an Island Outpost".
(Dunedin, the author).

ROE, M. (Ed.) (1967).
"The journal and letters of Captain Charles Bishop on the North-west Coast of America, in the Pacific and in New South Wales".
(Cambridge Univ. Press for Hakluyt Society, Second Series No. CXXXI).

SCHEFFER, V.B. (1958).
"Seals, Sea Lions and Walruses).
(Stanford Univ. Press).

SERVENTY, V.N. (1953).
The Archipelago of the Recherche.
pt. 4. Mammals.
Australian Geographical Society.
Report No. 1. (Melbourne).

SHAUCHNESSY, P.D. (1970).
Serum protein variation in southern fur seals, *Arctocephalus* spp., in relation to their taxonomy.
Aust. J. Zool. 18 : 331-43.

SHILLINGLAW, J.J. (Ed.) (1879).
"Historical Records of Port Phillip".
(Melbourne, Government Printer).

SIMPSON, K. (1961) *in* Fauna Survey Group reports for 1 Dec. 1960, 12 Jan. 1961.
Vict. Nat. 77 : 277,307.

SINGLETON, R.J. (1972).
New Zealand fur seals at Three Kings Islands.
N.Z. J. Mar. Freshw. Res. 6 : 649-50.

SORENSEN, J.H. (1950).
Elephant seals of Campbell Island.
Cape Exped, Ser. Bull. No. 6.

SORENSEN, J.H. (1951).
"Wild Life in the Subantarctic".
(Christchurch, Whitcombe and Tombs).

SORENSEN, J.H. (1969a).
New Zealand seals with special reference to the fur seal.
N.Z. Marine Dept. Fisheries Technical Report No. 39.
(Wellington).

SORENSEN, J.H. (1969b).
New Zealand fur seals with special reference to the 1946 open season.
N.Z. Marine Dept. Fisheries Technical Report No. 42.
(Wellington).

STIRLING, I. (1968).
Diurnal movements of the New Zealand fur seal at Kaikoura.
N.Z. J. Mar. Freshw. Res. 2 : 375-77.

STIRLING, I. (1972a).
Observations on the Australian sea lion *Neophoca cinerea* (Peron).
Aust. J. Zool. 20 : 271-79.

STIRLING, I. (1972b).
The economic value and management of seals in South Australia.
S.A. Dept. Fisheries, Pub. No. 2. (Adelaide).

STIRLING, I. and WARNEKE, R.M. (1971).
Implications of a comparison of the airborne vocalizations and some aspects of behaviour of the two Australian fur seal species, *Arctocephalus* spp., on the evolution and current taxonomy of the genus.
Aust. J. Zool. 19 : 227-41.

STOKES, J.L. (1846).
"Discoveries in Australia, with an account of the coasts and rivers explored and surveyed during the voyage of H.M.S. Beagle in the years 1837-43". 2 vols.
(London. Boone).

STORR, G.M. (1961).
The flora of the Shoalwater Bay Islands.
W. Aust. Nat. 8 : 43-50.

STREET, R.J. (1964).
Feeding habits of the New Zealand fur seal *Arctocephalus forsteri*.
N.Z. Marine Dept. Fisheries Technical Report No. 9. (Wellington).

TAYLOR, R.H. (1971).
Influence of man on vegetation and wildlife of Enderby and Rose Islands, Auckland Islands.
N.Z. J. Bot. 9 : 225-68.

WAITE, E.R. (1909).
Vertebrata of the Subantarctic Islands of New Zealand.
Art. XXV *in* The Subantarctic Islands of New Zealand. 2 : 542-600.
(Philos. Inst. Canterbury)

WILSON, G.J. (1974a).
A preliminary report on the distribution and abundance of the New Zealand fur seal (*Arctocephalus forsteri*) at the Auckland Islands December 8 1972 to January 15 1973. N.Z. Ministry of Agric. and Fisheries. Fisheries Technical Report No. 133. (Wellington).

WILSON, G.J. (1974b).
The distribution abundance and population characteristics of the New Zealand fur seal.
M.Sc. thesis. Dept. of Zoology, University of Canterbury, Christchurch.

WOOD JONES, F. (1925).
"The Mammals of South Australia, pt. 3. The Monodelphia". (Adelaide, Government Printer).

YOUNG, J. (1971).
Gannet Rock - West Coast Dive, South Pacific Underwater Mag. 10 (6) : 15.

9. ACKNOWLEDGEMENTS

I am most grateful to the various government agencies, institutions, colleagues and other individuals who, by their interest in the object of my enquiries and their prompt response, assisted very materially in the compilation of this report.

Reviewing the Australian situation was difficult enough from within, but the New Zealand region would have been impossible from the opposite side of the Tasman Sea without the generous assistance of Dr. Malcolm Crawley and Mr. Graham Wilson of the University of Canterbury. As usual, Judith King of the Department of Zoology, University of New South Wales, was able to lend a hand where it was needed.

APPENDIX A

ABBREVIATIONS USED IN TEXT

HRNSW	Historical Records of New South Wales. Vols. 1-7, 1893-1901. Sydney.
NSW : FISH	Fisheries Branch, Chief Secretary's Department, New South Wales.
NSW : NPWS	National Parks and Wildlife Service, New South Wales.
SA : NPWS	National Parks and Wildlife Service, Sough Australia.
TAS : CC	W.E.L.H. Crowther Collection, State Library of Tasmania.
TAS : FISH	Fisheries Division, Tasmanian Department of Agriculture.
TAS : NPWS	National Parks and Wildlife Service, Tasmania.
VIC : FWD	Fisheries and Wildlife Division, Ministry for Conservation, Victoria.
WA : DFF	Department of Fisheries and Fauna, Western Australia.

APPENDIX B

Data on the distribution and status of the Australian fur seal, *Arctocephalus pusillus doriferus*.

Known to the early sealers as sea bear, brown fur seal, grey fur seal; aboriginal name "wayanna" but specificity uncertain.

Key to status A breeding known, B breeding probable, C non-breeding, D status unknown.

NEW SOUTH WALES

MONTAGUE I. (36°15'S, 150°13'E)
1798, Feb. many seals in water. (D) Flinders, 1814 (1) : cxxi Rawson, 1946 : 72.
1925, Aug.-Nov. 200 (C) LeSouef, 1925 : 114.
1963. Summer peak NSW : NPWS.
1970, Nov. 150 (C) NSW : NPWS.
1971 300 maximum, pups born. (report from fishermen) (A) NSW : NPWS.
1974 200, numbers increasing NSW : NPWS.

SEAL ROCKS (32°28'S, 152°33'E), dedicated as a Nature Reserve.
1925 500 (A) LeSouef, 1925 : 115.
1970 22, including 1 large male (A) NSW : NPWS.
1972 minimum of 1 pup born (A) NSW : NPWS.
1974 12 (B) NSW : NPWS.

TASMANIA AND BASS STRAIT

ALBATROSS I. (40°23'S, 144°39'E), classified as a Conservation Area, TAS : NPWS.
1798, Dec. seals taken by Bass. (A) Flinders, 1801, 1814 (1) : clxxii
pre 1813 minimum of 12000 (Kelly) (A) Plomley, 1966 : 697.
1813, Feb.-Mar. 5783 skins taken from "seal rock" near Hunter I. (? Albatross I.). Kelly Log. TAS : CC.

1832, Oct. 1 seal seen (Robinson) (C) Plomley 1966 : 665.

1973, Jan.-Feb. 5 seen, including a subadult male tagged at Seal Rocks, Victoria. (C) Warneke, pers. obs.
Skeletal remains of *A.p.d.* found in large cave. Warneke, field catalog.

BETSY I. (43°03'S, 147°29'E), classified as a Conservation Area.
1974 10-20 (D) TAS : FISH.

BLACK PYRAMID (40°29'S, 144°19'E), also known as SEAL (Sailing Directions for Victorian and Bass Strait). Classified as a Conservation Area, TAS : NPWS.
1842 colony said to exist (D) Stokes, 1846 (1) : 299.
1972 small colony (Olsen) (D) VIC : FWD.
1973, Feb. no seals seen from boat. Warneke, pers. obs.

CAPE PILLAR, TASMANIA (43°13'S, 148°00'E).

1910	colony known (D)	Barrett, 1918 : 146.	
1945	estimated 2000 (Challenger)		VIC : FWD.
1972	60-80 (Dinger)	(D)	VIC : FWD.
1974	30-50	(D)	TAS : FISH.
1974	25-50	(D)	TAS : NPWS.

COUNCIL ROCKS, BANK'S STRAIT (not on modern charts, probably a local name for MORIARTY ROCKS, see below)

1925	150 (Fishermen)	(B)	LeSouef, 1925 : 114.
	1800-2000 (Mansfield)	(B)	LeSouef, 1925 : 114.
1945	"big colony" Fowler	(B)	VIC : FWD.
1974	500-800	(B)	TAS : FISH.

FRIAR ROCKS (43°32'S, 147°18'E).

1972	small colony (Olsen)	(D)	VIC : FWD.

GEORGE ROCKS (40°55'S, 148°20'E).

1816, Jan.	172 skins taken in 9 days, pups present. (A) Kelly (1920) : 174-80.		
1840's	sealing ground Stokes, 1846 (2) : 450.		
1972	small colony (Olsen)	(D)	VIC : FWD.

HIPPOLYTE ROCKS (43°07'S, 148°03'E).

1972, May-July.	50 (Dinger)	(D)	VIC : FWD.
1974	12-20	(D)	TAS : NPWS.

HOGAN GROUP (39°13'S, 147°00'E).

1840's	sealing in large cave	(B)	Doome, 1874.
1840's	home of brown fur seal	(B)	Gippsland Mercury, 2 Feb. 1875.
1842	fur seals in cave on largest island.	(B)	Stokes, 1846 (2) : 426.
1871	seals in large cave	(D)	Gould, 1971 : 66.
1925	300 (fisherman)	(B)	LeSouef, 1925 : 114.
1973, Dec. - 1974, Jan.	20-40 on East Islet.	(D)	(Murray-Smith) VIC : FWD.

JUDGEMENT ROCKS (39°30'S, 147°08'E).

1890	seals breeding on centre islet, sealing still occurring. (A) LeSouef, 1891 : 123.		
1965, Jan.	300-400 Dorward	(A)	VIC : FWD.
1973, Jan.	4000 (Murray-Smith)	(A)	VIC : FWD.

KENT GROUP (39°30'S, 147°20'E).

1925	200 (fishermen)	(D)	leSouef, 1925 : 114.

MAATSUYKER I. (43°39'S, 146°17'E).

1971	60 on Needle Rocks	(D)	TAS : NPWS.
1974	10-20 on north side	(D)	TAS : FISH.

MARIA I. (42°40'S, 148°05'E), once known as OYSTER I., now MARIA ISLAND NATIONAL PARK.

1802	"innumerable seals"	(B)	Péron, 1807 (1) : 301.
1805	sealing gang on island		HRNSW, 5 : 697.
1972	small colony on Ilôt Du Nord (Olsen)	(D)	VIC : FWD.
1972	2 or 3 groups = 200 (Dinger)	(D)	VIC : FWD.
1974	a few, seen regularly	(D)	TAS : NPWS.

MONCOEUR IS. (39°14'S, 146°31'E).

1925 300 on Western island (fishermen) (B) LeSouef, 1925 : 114.

1945 colony on eastern island (? in error for western), reported to be larger than Seal Rocks, Vic. (B) VIC : FWD.

1967, Jan. minimum of 200 at E. end of western island (Mirrabella) (B) VIC : FWD.

MORIARTY ROCKS (40°36'S, 148°16'E).

1974 maximum of 1000 (A) TAS : NPWS.

PEDRA BLANCA (43°52'S, 146°58'E).

1945 5000 (Challenger) (B) VIC : FWD.

1945 minimum of 1000 (Fowler) (B) VIC : FWD.

1972 small colony (Olsen) (D) VIC : FWD.

1974 12-20 (D) TAS : NPWS.

"PINEAPPLE" (? PARTRIDGE I.) (43°24'S, 147°06'E).

1974 5-10 (D) TAS : FISH.

PORT DAVEY, TASMANIA (43°20'S, 145°55'E), within the SW Fauna District, a Conservation Area.

1972 seals seen at Window Pane Bay (Olsen) (D) VIC : FWD.

1974 maximum of 20 (D) TAS : NPWS.

PYRAMID (39°49'S, 147°14'E).

1830, Dec. 400 skins taken (Robinson) (B) Plomley 1966 : 177, 302-3, 337, 443.

1974 300-400, increasing (B) TAS : NPWS.

REID'S ROCKS (40°15'S, 144°10'E).

1854, Nov. large herd Nixon, 1857 : 96.

1910 colony known (B) Barrett, 1918 : 146.

1925 1500-2000 (fishermen) (B) LeSouef, 1925 : 114.

1974, June 300-500 (B) TAS : NPWS.

SEAL IS. (38°56'S, 146°40'E), also known as DIRECTION IS.

1798 sufficient seals for a small speculation (Bass). Flinders, 1814 (1) : cxvii.

SCHOUTEN I. (42°20'S, 148°20'E).

1972 small colony, (Olsen) (D) VIC : FWD.

THE SISTERS (43°39'S, 146°23'E). The eastern island also known as Seal Rock, and Flat Top 1.

1971 colony known (D) Gould, 1872 : 66.

1944 seals numerous (B) Aust. Pilot, 1944 (2) : 219-20.

1945 4000 (Challenger) (B) VIC : FWD.

1972 small colony (Olsen) (D) VIC : FWD.

1974 50-150 on "Flat-top Sister" (B) TAS : FISH.

TENTH I. (39°57'S, 146°59'E), also commonly known as BARRENJOEY.

1798 covered with hair (?) seals Flinders, 1814 (1) : cli.

1910 colony known (B) Barrett, 1918 : 137.

1925 200 (fishermen) (B) LeSouef, 1925 : 114.

1000 (Mansfield) (B) LeSouef, 1925 : 114.

1974 200 (A) TAS : NPWS.

WHITE ROCK (42°25'S, 148°10'E), also known as Isle Des Phoques.

1802, Feb.	"covered with a prodigious number of seals" (Bailly)	(B)	Crumpston, 1973 : 48.
1802, Feb.	"covered with seals" (Baudin)	(B)	Cornell, 1974 : 349.
1816, Jan.	6 skins collected		Kelly (1920) : 181.
1910, Jan.	50 seals in cave	(B)	Barrett, 1918 : 144.
1925	100	(B)	LeSouef, 1925 : 114.
1945	500 (Challenger)	(B)	VIC : FWD.
1974	10-20	(D)	TAS : FISH.

WRIGHT'S ROCK (39°36'S, 147°32'E).

1803, May	seals heard at night.	(D)	Flinders, 1814 (2) : 271.
1971, Jan.	40 ashore, including males, females and young.	(B)	Marginson and Murray-Smith, 1972 : 213.

VICTORIA

CAPE BRIDGEWATER (38°23'S, 141°25'E).

1948 60 in caves at E point; "young" seen. (Patterson) (B) VIC:FWD.
1948 80-100 (Sealey) (B) VIC:FWD.
1971 seals seen in cave. (Beinssen) (B) VIC:FWD.
1971 young seen (abalone fishermen) (B) VIC:FWD.

CAPE NELSON (38°25'S, 141°34'E).

1948 60 in caves at E point. (Sealey) (D) VIC:FWD.
1948 50; bulls seen Nov-Dec., young seals in Jan-Feb. (Patterson) (B) VIC:FWD.
1971 seals in cave, to be seen at any time of year. (Beinssen) (B) VIC:FWD.

KANOWNA I. (39°10'S, 146°18'E), part of Wilsons Promontory National Park.

1874 seals on adjacent islets. (D) Doome, 1874.
1925 600 (fishermen) (B) LeSouef, 1925 : 114.
1945 1500-2000; 250 on adjacent islets. (Fowler) (B) VIC:FWD.
1964, June 300 maximum, on N slope and adjacent rocks (Dorward and Pizzey, mimeogr. report) VIC:FWD.
1966, Oct. 500-650 on N slope. (Baum) VIC:FWD.
1974, July 1800 on island and adjacent islets. (Warneke, pers. obs.).

LADY JULIA PERCY I. (38°25'S, 142°00'E), a State Faunal Reserve.

1822/1828 sealers at island (D) Mahoney, 1937 : 332.
1866 seals in "great numbers" (Griffiths) (B) Mahoney, 1937 : 332.
1925 3000-4000 (fishermen) (B) LeSouef, 1925 : 114.
1936, Dec. 3000-4000; more than 1000 pups. (A) Tubb and Brazenor, 1937 : 435.
1945 5000 (Lewis) (A) VIC:FWD.
1948, Nov-Dec. 2000 (Tarr) Coleman, 1951 : 177.
1963, Dec. colony larger than Seal Rocks (= 5000). (B) Pescott, 1965 : 294.
1967, Dec. slight increase (from 1963); some bachelor sites now maternal sites. (A). Pescott, 1968 : 127.
1974, Feb. 962 pups tagged, of estimated 1800. Warneke, pers. obs.

LAWRENCE ROCKS (38°25'S, 141°41'E), a State Faunal Reserve.

1948 25, in water only (Patterson) VIC:FWD.
1948 30 (Sealey) VIC:FWD.

SEAL IS. (38°56'E, 146°40'E), also known as Direction Is.

1798, Jan. "the number of seals was by no means equal to what we had been led be expect. It is certain, however, that great numbers had been destroyed (by whom or what?) ... pups seem now to be nearly full grown (weaned ?)... a speculation on a small scale might be carried on with advantage" (Bass) (A) Rawson, 1946 : 36.
1966, Dec. 180 in 2 groups on White Rock, mainly yearlings but including 4 bulls and 6 adult females. (Baum) (C) VIC:FWD.
1966, Dec. 60-70 yearlings, 3 adult females at SW end of Rag I. (Baum). Normally only up to 6 old seals at E end. (Truscott) (C) VIC:FWD.

SEAL ROCKS, off Phillip I. (38°32'S, 145°06'E), a State Faunal Reserve.

1801, Mar.	"covered with seals ... of a large size ... I judged them to be of that species ... called by the fishermen Sea Elephants ... they may be found in great numbers". (A) Grant 1803 : 123.		
1801, Dec.	several thousand pups lying on shore ... evidence of sealers found. (Murray) (A) Lee, 1915 : 104.		
1850's	20-40	(B)	Lewis, 1942 : 24.
1860	100 (fishermen)	(B)	VIC:FWD.
1869	20	(Kennon) (B)	Coleman, 1951 : 176.
1907	1000-2000	(A)	Vict. Nat. 24 : 54.
1913, Mar.	400-600	(A)	Gabriel, 1913 : 31.
1925	3000-4000 (fishermen)		LeSouef, 1925 : 114.
1945	5000	(Lewis)	VIC:FWD.
1966-1974	colony stable at about 5500 (shore counts); producing an annual crop of about 2000 pups. Warneke (1975).		

SKERRIES (37°45'E, 149°31'E), part of Wingan National Park.

1910	colony known	(B)	Barrett, 1918 : 146.
1946	300-400, maximum of 800 (Fowler)	(B)	VIC:FWD.
1966, Oct.	450-500	(Baum) (A)	VIC:FWD.
1974, Feb.	about 50 pups. (A) Warneke, pers. obs.		

APPENDIX C

NON-SPECIFIC RECORDS OF SEALS IN AUSTRALIAN WATERS

BABEL I. (39°57'S, 148°20'E).
1801 sealers camp (Murray) Lee, 1915 : 85.
1817, Dec. many seals seen (B) King, 1827 (1) : 7.

CAT I. (39°58'S, 148°22'E).
1798, Jan. a boat-load of seals and gannets obtained by Bass. (B) Flinders, 1814 (1) : cxcii.
1798, Jan. seals encountered by Bass, males territorial (B) Collins, 1802 (2) : 191.

COUNCILLOR I. (39°49'S, 144°11'E).
1813, Jan. 2 skins taken (D) Kelly Log. TAS : CC.

CRAGGY I. (39°41'S, 147°41'E).
1830's sealers camp (Robinson). Plomley, 1966 : 612.
(1871) sealing ground known as "The Stacks" (B) Gould, 1872 : 66.
1890 breeding colony (A) LeSouef, 1891 : 123.

CURTIS GROUP (39°28'S, 146°39'E).
1820's sealers camp for 5 years (Robinson) Plomley, 1966 : 326.
seals taken at "The Slipper" Plomley, 1966 : 337.

DOUBTFUL IS. (34°22'S, 119°35'E).
1802 seals seen on small islet nearby. Flinders, 1814 (1) : 76.

ELEPHANT ROCK (39°50'S, 144°10'E).
1802, Jan. 6000-7000 (Murray) (A) Lee, 1915 : 122.
1802 600 prime skins taken HRNSW, 5 : 8.

HUNTER GROUP (40°30'S, 144°50'E).
1832, June sealers camp. (Robinson) Plomley, 1966 : 612.
1834, Feb. sealing occurring (Robinson) (D) Plomley, 1966 : 845.

KENT GROUP (39°30'S, 147°20'E).
1791 some seals seen. (D) Flinders, 1814 (1) : cxliv.
1801, Nov. seals seldom ashore, evidence of sealers found. (Murray) (B) Lee, 1915 : 98.
1801, Dec. 2 seals killed (Murray) Lee, 1915 : 98.
1830 sealers camp (Robinson) Plomley, 1966 : 246.
1840's home of the black fur seal. Gippsland Mercury, 2 Feb. 1875.

KING I. (39°50'S, 144°00'E).
1802, Jan. fur seals killed at Seal Bay, vast number on shore. (Murray) (A) Lee, 1915 : 85.
(N.B. Localities named for seals: Phoques Bay, Seal Bay, Sea Elephant Bay, Seal Point).

NEW YEARS IS. (39°41'S, 143°49'E), classified as a Conservation Area, TAS : NPWS.

1802 "covered with innumerable legions of various species" (Faure) Péron,1816 (2) : 22.

PRIME SEAL I. (40°04'S, 147°46'E), also known as HUMMOCK I.

No evidence other than name. Atlas of Tasmania, Lands & Survey Dept., 1965.

THE SISTERS (EAST: 39°30'S, 148°00'E; WEST: 39°42'S, 147°55'E), classified as Conservation Areas, TAS : NPWS.

1802, Oct. sealing by French gang. Péron, 1816 (2) : 4; Cumpston, 1973 : 15-16.

THREE HUMMOCK I. (40°26'S, 144°55'E), classified as a Conservation Area, TAS : NPWS.

1802, Dec. small islet of S. coast entirely covered with seals. (Freycinet) (B) Cumpston, 1973 : 57.

1830's seals killed on small islet off S. coast. (Robinson) (B) Plomley 1966 : 670.

WEST I. (34°06'S, 120°18'E).

1802, Jan. frequented by seals. Flinders, 1814 (1) : 78.

* WATERHOUSE I. (40°48'S, 147°38'E).

1798 covered with hair (?) seals. Flinders, 1814 (1) : cli.

* A doubtful record as Flinders passed at a distance of about 1.5 km and none of his party landed.

APPENDIX D

DATA ON THE DISTRIBUTION AND STATUS OF THE NEW ZEALAND FUR SEAL, *Arctocephalus forsteri*

Known to the early sealers as sea bear or black fur seal; maori name "Kekeno".

Key to status: as for Appendix B.

SOUTH AUSTRALIA

ALTHORPE I. (35°22'S, 136°51'E).
1969 breeding colony (A) King, 1969 : 850.

CASUARINA IS. (36°06'S, 136°42'E).
1969 fur seals on (N) island (D) King, 1969 : 851.
1974, Feb. minimum of 40 on N. island, mostly males. Warneke, pers. obs.

FOUR HUMMOCKS (34°46'S, 135°01'E).
1968 colony known (B) King, 1968 : 632.
1969 50-100 (B) King, 1969 : 850.

GAMBIER I. (35°10'S, 136°27'E).
1969 mapped as seal locality (D) King, 1969 : 850.

KANGAROO I. (35°50'S, 137°20'E).
1969 colony at Cape Du Couedic (D) King, 1969 ; 850.
1974, Feb. non-breeding group, mostly of subadult males. (C) Warneke, pers. obs.

SOUTH NEPTUNE IS. (35°19'S, 136°06'E).
1970 several breeding colonies on N. island, including a minimum of 920 females (A) Stirling, 1971 : 247.

THISTLE I. (35°00'S, 136°08'e).
1969 maximum of 20 (D) King 1969 : 850.

TASMANIA AND BASS STRAIT

* CAPE BARREN I. (40°25'S, 148°15'E).
1798 main concentration at Cone Pt. (B) Flinders 1814 (1) : cxxix, cxxxiii.
1798 9000 skins taken by pioneer gang. (Bishop) Roe, 1967 :

* CLARKE I. (40°33'S, 148°11'E).
1798 furseals abundant at S. end. (B) Flinders, 1814 (1) : cxxxiii.

KENT GROUP (39°30'S, 147°20'E).
1840's home of the black fur seal (D) Gippsland Mercury 2 Feb. 1875.

* LOW IS. (40°08'S, 147°44'E).
1798, Oct. a few seals killed (D) Flinders, 1814 (1) : cxlv.

* PASSAGE IS. (40°31'S, 148°19'E).
1798 seals abundant. Flinders, 1814 (1) :
1830 24 skins taken in 1 yr by sealer at W. island (known as FORSYTH or PENGUIN I.) (Robinson) (D) Plomley, 1966 : 295.

SALTPETRE ROCKS, reported off W. coast of KING I. (39°50'S, 144°00'E), but not on modern charts.
1925 100, colony known locally as black seals (Knight) (B) LeSouef, 1925 : 114.

WESTERN AUSTRALIA

BOXER I. (34°00'S, 121°40'E).
1969 mapped as fur seal locality. (D) King, 1969 : 851.

CAPPS I. (33°59'S, 121°41'E).
1969 mapped as fur seal locality. (D) King, 1969 : 851.

CHRISTMAS I. (33°51'S, 124°07'E), also known as DOW I.
1948, June 100 (F.R.V. "Wareen") (B) Serventy, 1953 : 46.
(n.d.) most abundant on offlying Coopers Reef. Serventy, 1975 : 46.
1969 mapped as fur seal locality. King, 1969 : 851.

ECLIPSE I. (35°11'S, 117°23'E).
1967 breeding colony, minimum of 12 pups born (A) King 1969 : 849.

FIGURE OF EIGHT I. (34°01'S, 131°36'E).
1969 mapped as fur seal locality. (D) King, 1969 : 851.

HOOD I. (34°09'S, 122°02'E).
1969 mapped as fur seal locality. (D) King, 1969 : 851.

MIDDLE I. (34°06'S, 123°11'E).
once occupied by sealers. Serventy 1953 : 46.

MONDRAIN I. (34°08'S, 122°14'E).
1802, Jan. seals of reddish fur taken. (D) Flinders, 1814 (1) : 83.
1969 mapped as a fur seal locality. (D) King, 1969 : 851.

ROUND I. (34°12'S, 122°06'E).
1969 mapped as a fur seal locality. (D) King, 1969 : 851.

---

* My identification of these seals as *A. forsteri* is based on Flinders description, which on points of size and especially of colour is indicative of this species rather than *A. p. doriferus*. Admittedly Flinders was comparing these fur seals with sea lions nearby, but in other later references he described other fur seals with reddish fur of poorer quality e.g. at Albatross I. which was then occupied by *A. p. doriferus*, (see Flinders, 1814 (1) : clxxii). Skeletal material from Albatross I., which I have reason to believe pre-dates 1832, is of *A. p. doriferus* (VIC : FWD Collection). Other writers have stated without reservation that both black (*A. forsteri*) and brown (*A. p. doriferus*) fur seals originally occurred in Bass Strait, e.g. Dunderdale (c. 1895 : 305) and Gould (1872 : 62).

SALISBURY I. (34°21'S, 123°32'E).
1950, Nov. 50 adults. (B) Serventy, 1953 : 46.
1969 mapped as a fur seal locality. (D) King, 1969 : 851.

SEAL ROCK (34°01'S, 121°38'E).
1969 mapped as a fur seal locality, (D) King, 1969 : 851.

TERMINATION I. (34°28'S, 122°02'E).
1969 mapped as a fur seal locality. (D) King, 1969 : 851.

WEDGE I. (34°06'S, 122°50'E).
1969 mapped as a fur seal locality. (D) King, 1969 : 851.

Note: All these localities except Eclipse I. are part of the Recherche Archipelago, of which Flinders (1814 (1) : 91) said, "All the islands seem to be more or less frequented by seals; but I think not in numbers sufficient to make a speculation from Europe advisable on their account... the seals being mostly of the hair kind. and the fur of such others as were seen was red and course".

NEW ZEALAND : NORTH ISLAND

CAPE BRETT (35°10'S, 174°20'E).
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

CAPE KIDNAPPERS (39°39'S, 177°06'E).
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

CAPE PALLISER (41°37'S, 175°17'E).
1972 wintering colony (C) Singleton, 1972 : 649.

CAPE TERAWHITI (41°18'S, 174°36'E).
1962, Aug. 300, including "pups" (Tunbridge) (D) Sorenson, 1969a : 10.
1972 wintering colony. (C) Singleton, 1972 : 649.
1974 mapped as a non-breeding colony (C) Wilson, 1974b.

GANNET I. (37°58'S, 174°34'E).
1971 2 seals seen. (D) Young 1971 : 15.
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

MOTUPIA I. (34°37'S, 172°48'E).
1969 wintering colony of 130 (Jose) (C) Singleton, 1972 : 649.
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

SINCLAIR HEAD (41°22'S, 74°42'E).
1972 wintering colony. (C) Singleton, 1972 : 649.
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

SUGARLOAF I. (39°03'S, 174°01'E).
1972 wintering colony. (C) Singleton, 1972 : 649.
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

THREE KINGS IS. (34°10'S, 172°08'E).
1967, Dec. seals first sighted. Singleton, 1972 : 649.
1968, Oct. 20, on westernmost of PRINCES IS. (C) Singleton, 1972 : 649.
1969 70-80 (C) Singleton, 1972 : 649.
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

TURAKIRAE HEAD (41°26'S, 174°55'E).
1972 wintering colony. (C) Singleton, 1972 : 649.
1974 mapped as a non-breeding colony. (C) Wilson, 1974b.

NEW ZEALAND : SOUTH ISLAND

ABUT HEAD (43°07'S, 170°15'E).
1974 colony mapped. (D) Wilson, 1974b.

BANKS PENINSULA (EAST HEAD: 43°46'S, 173°08'E).
1974 non-breeding colony. (C) Wilson, 1974b.

BANKS PENINSULA (W. OF AKAROA HEAD at 43°53'S, 172°49'E).
1974 non-breeding colony. (C) Wilson, 1974b.

BLIGH SOUND (southern headland at 44°46'S, 167°26'E).
1974 probably breeding colony. (B) Wilson, 1974b.

BREAKSEA I. (45°35'S, 166°37'E).
1947, Dec. less than 100 (Falla) (B) Sorensen, 1969b : 52.

CAPE FOULWIND (41°45'S, 171°27'E).
1874, Jan. 11 seals collected at The Steeples. (Hector) (A) Clarke, 1875 : 659.
1909 "a few" on Steeple Rock (B) Waite, 1909 : 548.
1969 7 seen (Gaskin) Sorensen, 1969a : 11.

CAPE SAUNDERS (45°52'S, 170°44'E).
1974 non-breeding colony. (C) Wilson, 1974b.

CASCADE POINT (44°01'S, 168°22'E).
1909 a few occur Waite, 1909 : 548.
1934, Nov. 200 on offshore reef, mostly non-breeders (Falla) (B) Sorensen, 1969b : 52.
1947, Dec. 25 on offshore reef, maximum of 500 on point. (Falla) (B) Sorensen, 1969b : 52-3.
(1948) 500 (Falla) (B) Sorensen, 1969b : 68.

CASWELL SOUND (North of, at 44°56'S, 167°11'E, and on southern headland, at 44°59'S, 167°06'E).
1974 probable breeding colonies. (B) Wilson, 1974b.

CHALKY I. (46°03'S, 166°32'E).
(1948) 1000 (Falla) (D) Sorensen, 1969b : 68.
1974 non-breeding colony. (C) Wilson, 1974b.

CHARLES SOUND (southern headland at 45°03'S, 167°03'E).
1974 probable breeding colony. (B) Wilson, 1974b.

CLIFFY HEAD (43°02'S, 170°26'E).
1974 non-breeding colony. (C) Wilson, 1974b.

DOUBTFUL SOUND (45°17'S, 166°52'E).
1964, May 109 on Seal Rock (Gaskin) (B) Sorensen, 1969a : 11.
1974 probable breeding colony. (B) Wilson, 1974b.

D'URVILLE I. (40°50'S, 173°52'E).
1964 colony reported. (D) Street, 1964 :1.
1974 non-breeding colony. (C) Wilson, 1974b.

DUSKY SOUND (south of entrance at 45°50'S).
1974 colony known. (D) Wilson, 1974b.

FIVE FINGERS PENINSULA (45°44'S, 166°28'E).
1793 4500 taken at Dusky Sound in 1 year. (Falla). Sorensen, 1969b : 21.
1946, July 1047 skins taken. (A) Sorensen, 1969b ; 40.
1948 colonies totalling 3000 (Falla) (A) Sorensen, 1969b : 68.
1974 2 breeding colonies. (A) Wilson, 1974b.

GEORGE SOUND (south of entrance at 44°50'S, 167°21'E).
1958, July colony of 200. (B) photo in Sorensen, 1969a : 35.
1974 probable breeding colony. (B) Wilson, 1974b.

GILLESPIE POINT (43°24'S, 169°50'E).
1974 non-breeding colony. (C) Wilson, 1974b.

GREEN I. (46°46'S, 168°30'E).
1974 breeding colony. (A) Wilson, 1974b.

GULCHES HEAD (46°06'S, 166°34'E).
1946, June 39 skins taken. Sorensen, 1969b : 40-41.

HAUMURI BLUFF (42°34'S, 173°31'E).
1974 non-breeding colony. (C) Wilson, 1974b.

KAIKOURA (42°26'S, 173°43'E).
1950/51 seals first observed "in quantity" (Gorman) Sorensen, 1969a : 27.
1956, May 46 (Bell) Stonehouse, 1965.
1957, Dec. 7 Stonehouse, 1965.
1958 maximum of 270 (Gorman), Sorensen, 1969a : 27.
1960/64 60-150 Stonehouse, 1965.
(1964) 150-270 Street, 1964 : 1.
1964, May-June. 520 (Gaskin). Sorensen, 1969a : 11.
1967/69, May-July. maximum of 800. Stirling, 1970 : 767.
1974 summer maximum of 350. Wilson, 1974b.

KNIGHT'S POINT (43°43'S, 169°15'E).
1974 non-breeding colony. (C) Wilson, 1974b.

LONG REEF POINT (44°29'S, 168°00'E).
1974 breeding colony. (A) Wilson, 1974b.

LOOKING GLASS BAY (44°54'S, 167°15'E).
1964, May 63 seen (Gaskin) Sorensen, 1969a : 11.
1974 probably breeding colony. (B) Wilson, 1974b.

MILFORD SOUND (south of entrance at 44°37'S)
1964, May 2 seen in Sound (Gaskin) Sorensen, 1969a : 11.
1974 probable breeding colony. (B) Wilson, 1974b.

MOTUNAU I. (43°04'S, 173°05'E).
1974 colony known. (D) Wilson, 1974b.

NANCY SOUND (southern headland at 45°06').
1974 breeding colony. (A) Wilson, 1974b.

NUGGET POINT (46°27'S, 169°49'E).
1964 30 (D) Street, 1964 : 1.
1974 breeding colony. (A) Wilson, 1974b.

OPEN BAY IS. (43°52'S, 168°53'E).
1964, May. 1300 (Gaskin) (A) Sorensen, 1969a : 11.
1968, Sept. 1000 (A) Stirling, 1970 : 768.
1970, Jan. colony size calculated at 2750 on Taumaka I. (A) Crawley and Brown, 1971 : 394.

OTAGO HARBOUR (45°47'S, 170°43'E).
1964 650 on Otago Peninsula. Street, 1964 : 1.
1974 non-breeding colony. (C) Wilson, 1974b.

PUYSEGUR POINT, east of at a) 166°41'.
b) 166°48'.
c) 166°53'.
1974 colonies of unknown status at a) and b) (D);
breeding colony at c) (A) Wilson, 1974b.

RUAPUKE I. (46°46'S, 168°30'E).
1946 small rookeries on many of the outliers (A) (Falla). Sorensen, 1969b : 67.
1974 breeding colonies. (A) Wilson, 1974b.

SEAL I. (45°36'S, 166°35'E).
1974 non-breeding colony. (C) Wilson, 1974b.

SEPARATION POINT (40°47'S, 172°59'E).
1974 non-breeding colony. (C) Wilson, 1974b.

STEPHENS I. (40°41'S, 174°00'E).
1974 non-breeding colony. (C) Wilson, 1974b.

THE KNOBBYS (44°28'S, 167°50'E).
1974 non-breeding colony. (C) Wilson, 1974b.

YATES POINT (44°30'S, 167°49'E).
1974 breeding colony. (A) Wilson, 1974b.

NEW ZEALAND : MAJOR ISLANDS, including Macquarie I.

ANTIPODES IS. (49°41'S, 178°43'E), discovered 1800.
1804-1806. 60,000 skins taken by pioneer gang. (A). Redwood, 1956 : 30.
(1927) seals rarely seen (Bollons). (D) Sorensen, 1969b : 64.
1946 no re-establishment (Falla). Sorensen, 1969b : 23.
1969, Feb. 1100 counted, between North Cape and Albatross Point. (Taylor). (C). Sorensen, 1969b : 79.

AUCKLAND IS. (50°50's, 166°00'E), discovered 1806.
1807 sealing begun. Redwood, 1956 : 44.
1823 13,000 fur seal skins taken by gang of the ship "Henry". (A) Morell, 1832.
prior 1826 main period of sealing. McNab, 1909 : 344.
1830, Jan. no fur seals found. Morell, 1832.
1864 black seals in W. arm of Carnley Harbour. (B) Musgrave, 1865 : 19.
1939-45. few seen. (D) Sorenson, 1951 : 33.
1945 many of best rookery sites still deserted (Falla). (D) Sorenson, 1969b : 23.
(1948) possibly several thousand, but no real data available. (Falla). (D) Sorenson, 1969b : 65.
1974 1000 (A) Wilson, 1974a.

BOUNTY IS. (47°41'S, 179°03'E), discovered 1788.

1804	visited, but not worked by American sealer. Redwood 1950 : 24.
1807	8000 skins taken in 6 months. Redwood, 1950 : 26.
1831	5 only seen at breeding time. (Biscoe). (D) Falla, 1948 : 154.
1907	one or two seen. (D) Waite, 1909 : 548.
1909	quite a small colony. (Bollons). (B) Waite, 1909 : 548.
1927	3000 estimated from photos. (Falla). (A) Sorenson, 1969b : 64.
1948, Jan.	several thousand, many of them new pups. The Press, Christchurch.
1974	5500 Wilson, 1974b.

CAMPBELL I. (52°33'S, 169°08'E), discovered 1810.

1810	15,000 skins taken by pioneer gang. Falla, 1948 : 148.
1922	284 skins declared for royalty. Sorensen, 1969b : 16.
1924	66 skins declared for royalty. Sorensen, 1969b : 16.
1927	maximum of 1000 (Bollons). (A) Sorensen, 1969b : 65.
1948	minimum of 2000 (Falla). (A) Sorensen, 1969b : 65.
1958, Jan.-Feb.	count of 771, including 71 pups, considered well below actual number (Street) (A) Bailey and Sorensen, 1962 :

CHATHAM IS. (44°50'S, 176°30'W), discovered 1791.

1809	visited by sealing vessel "Pegasus". McNab, 1909 : 161.
1818	visited by sealing vessel "Sophia". McNab, 1909 : 230.
1937	breeding colonies on outlying Star Keys and Forty Fours, the latter densely populated. (Falla) (A) Sorensen, 1969b : 64.
1946	steady increase (Falla) (A) Sorensen, 1969b : 23.
1948	non-breeding groups on main island; at South-east I. about 10 seen (Abernathy) (C) Sorensen, 1969b : 64.
1948	maximum of 2000 (Falla). (A) Sorensen, 1969b : 64.
1974	2100 Wilson, 1974a.

MACQUARIE I. (54°40'S, 158°50'), discovered 1810.

1810/11	57,000 skins taken by pioneer gang. Cumpston, 1968 : 17.
1815	fur seal colonies exhausted. Cumpston, 1968 : 35.
1852	gang taking elephant seals found no fur seals. Gwynn, 1953 : 2.
1919-1948	a few fur seals in summer. Gwynn, 1953 : 2.
1929-30	none seen by research expedition. Gwynn 1953 : 2.
1946	no re-establishment (Falla). Sorensen, 1969b : 23.
1948	small group found by A.N.A.R.E. team. Csordas, 1962 : 226.
1950	174 at North Head. Csordas, 1963b : 256.
1955	first record of breeding. Csordas, 1936b : 257.
1950-1964	summer counts at North Head, using to maximum of 474. Csordas and Ingham, 1965 : 88.
1959	540 counted on E. coast. Csordas, 1962 : 256.
1965, Feb.	2 fur seals on Clerk Islet. MacKenzie, 1968 : 245.
1965, Mar.	637 at North Head, new groups in excess of 100 at NW and SE ends of island. (C) Johnstone, 1972 : 522.
1971	total population 900-1000. (A) Johnstone, 1972 : 522.

SNARES IS. (48°00'S, 166°35'E), discovered 1791.

1803	visited by sealing vessel "Endeavour". McNab, 1909 : 136.
1810-17	marooned gang took only 1300 skins. McNab, 1909 : 224.
1830	no fur seals found by American sealer. Morell, 1832.
1980	2 only known. (Fairchild) Chapman, 1891.
1909	colony known. Waite, 1909 : 548.
1915	300 skins taken by one gang. (Falla). (B) Sorensen, 1969b : 24.
1944	maximum of 20 young bulls at Boat Harbour. (Falla). Sorensen, 1969b : 66.

1947, Nov.-Dec. 2000 on main island, less than 1000 on Broughton I. and Western Reef. (A) (Falla) Sorensen, 1969b : 66.
1948, Jan.-Feb. maximum of 200 on main island. Richdale (n.d.) : 113.
1970, Nov.-Dec. 1150 on main island; 115 on Broughton I. Crawley, 1972 : 120.

SOLANDER I. (46°35'S, 166°54'E), discovered 1770.
1803, May few seals found by sealers. McNab, 1909 : 135.
1808-1813 5 sealers on the island. McNab, 1909 : 207-212.
1946, June 95 skins taken, mainly females, and pups. (Rapson). (A) Sorenson, 1969b : 40.
1947, Dec. maximum of 1000, including not more than 300 females. (Falla) Sorensen, 1969b : 51.
1948, Aug. herd augmented by non-breeders, total about 2000. (Falla) Sorensen, 1969b : 68.
1974 5000 Wilson, 1974b.

STEWART I. (47°00'S, 168°00'S, charted in part 1770, found to be an island 1809, or earlier. McNab, 1909 : 158.
1808/09 several vessels from Sydney sealing in the area. McNab, 1909 : 156.
1948, July 300 on Bench I., total population of Stewart I., Big South Cape I., and Poutama I. about 2000. Seals seen but not counted on Breaksea I., Mogi I. and Codfish I. (Falla) Sorensen, 1969b : 67.
1961, Jan. 150 on Bench I. Street, 1964 : 1.
1974 summer population 3150. Wilson, 1974b.

APPENDIX E

Data on the distribution and status of the Australian sea lion, *Neophoca cinerea*.

Also known as Councillor Seal and White-capped Sea Lion; known to the early sealers as hair seal.

Key to status: A breeding known, B breeding possible, C non-breeding, D status unknown.

TASMANIA AND BASS STRAIT

ANSER I. (39°08'S, 146°19'E)
1840's said to occur (locality in error, should probably be Kanowna I. nearby) Doome, 1875.

BATTERY I. (40°28'S, 148°11'E)
1798, Feb. large hair seals seen. (D) Flinders, 1814 (1) : cxxviii.

CLARKE I. (40°33'S, 148°11'E).
1798, Feb. large hair seals at Seal Point. (D) Flinders, 1814 (1) : cxxviii.

KENT GROUP (39°30'S, 147°20'E).
1802 seals and hair seals seen. (D) Shillinglaw, 1879.

PASSAGE I. (40°31'S, 148°20'E), known to the sealers as Sea Lion I. Plomley, 1966 : 442.
1788, Feb. possibly on this island at that time. (D) see Flinders, 1814 (1) : cxxxiii.

LITTLE ANDERSON I. (40°17'S, 148°07'E), known to the sealers as Hair Seal I.
1830's evidence of name only. See Plomley, 1966 : 273.

TASMANIAN COAST
remains found in aborigines' kitchen middens. Wood Jones, 1925 : 363.

* WATERHOUSE I. (40°48'S, 147°37'E).
1798 covered with sea birds and hair seals. (D) Flinders, 1814 (1) : cli.

---

* A doubtful record as Flinders passed at a distance of about 1.5 km and none of his party landed.

SOUTH AUSTRALIA

CASUARINA I. (36°06'S, 136°42'E).
1973, Feb. about 10 in view, among fur seals. (C) Warneke, pers. obs.

DANGEROUS REEF (34°49'S, 136°12'E).
1925 colony known. (D) LeSouef, 1925 : 113.
1966 Oct. large number of very young pups. (A) Marlow, 1968 : 39.
1967 July 160 Marlow, 1968 : 42.
1967 Oct. 30 (decline thought due to disturbance). Marlow, 1968 : 42.

1974 possibly the major breeding colony in South Australian waters. (A) Marlow and King, 1974 : 126.

1974 maximum of 400 during the breeding season. (A) King, pers. comm.

DOG I. (32°29'S, 133°20'E).

1802, Feb. seals killed (Flinders Rough Log) (D) Cooper, 1953 : 69.

ENGLISH I. (34°38'S, 136°12'E).

1972 population, with that of Lewis I., about 50. (D) (Fairbank) Stirling, 1972b : 8.

EVANS I. (32°22'S, 133°28'E).

1925 colony known. (D) LeSouef, 1925 : 116.

FENELON I. (32°35'S, 133°17'E).

1972 small colony. (D) Wace, pers. comm.

FLINDERS I. (33°43'S, 134°30'E).

1802, Feb. harems of 4 to 5 females, every 200 to 300 yards of beach. (A) Flinders, 1814 (1) : 125.
several hair seals killed (Flinders Fair Log). Cooper, 1953 : 39.

FOUR HUMMOCKS (34°46'S, 135°01'E).

1966, Oct. non-breeding colony. (C) Marlow, 1968 : 39.

GOAT I. (32°18'S, 133°30'E).

1802, Feb. 4 hair seals taken. Flinders, 1814 (1) : 113.
"the seals killed were of the hair kind and not numerous". (Flinders Rough Log) (D) Cooper, 1953 : 70.

1925 colony known. (D) LeSouef 1925 : 116.

KANGAROO I. (35°50'S, 137°15'E).

1802, Apr. hair seals at Kangaroo Head. (B). Flinders, 1814 (1) : 169.

1803, Jan. "great number of otaries on the beach". (Baudin) (B) Cornell, 1974 :

1969/70 minimum of 200 at Seal Bay. (C) Stirling, 1972b : 4.

1972 abundant skeletal remains on small islet at West Bay. Stirling, 1971 : 276; 1972b : 10.

1972 colonies at Copes Bouger and Borda. (D) Stirling, 1972b : 1.

1974 383 counted at Seal Bay; breeding occurs at adjacent bay, of prohibited entry. (A) SA : NPWS.

KIRKBY I. (34°33'S, 136°13'E).

1802, Mar. a few hair seals ashore. (D) Flinders, 1814 (1) : 153.
a few killed. (Flinders Fair Log). Cooper, 1953 : 50.

LEWIS I. (34°58'S, 136°01'E).

1972 population, including that of English I., about 50. (Fairbank) (D) Stirling, 1972b : 8.

NEPTUNE IS. (N. GROUP: 35°14'S, 136°04'E).
(S. GROUP: 35°19'S, 136°06'E).

1966, Oct. no evidence of breeding at S. Neptunes. (C) Marlow, 1968 : 39.

1969/70 80-100 at S. Neptunes in summer; adult males, females with pups mainly at N. end. (A) Stirling, 1972a : 272.

1972 breeding colony in N. Group. (A) Stirling, 1972b : 10.

PEARSON I. (33°27'S, 134°17'E).

pre 1925 rookery visited during breeding season. (A) Wood Jones, 1925 : 372.

1925 colony known. (B) LeSouef, 1925 : 116.

1966, Oct. non-breeding colony. (C) Marlow 1968 : 39.

POINT LABATT (33°09'S, 134°16'E), classified as a Prohibited Area, SA : NPWS.

1966 over 50 at haul-out site. (C) Stirling, 1972b : 7.

1970 less than 30. (C) Stirling, 1972b : 7.

PRICE I. (34°42'S, 135°17'E).

1925 colony known. (D) LeSouef, 1925 : 116.

SMOOTH I. (32°29'S, 133°20'E).

1802, Feb. seals killed. (Flinders Rough Log) (D) Cooper, 1953 : 69.

ST. FRANCIS I. (32°30'S, 133°17'E).

1802 a few hair seals seen (on St. Francis I.) (Flinders Fair Log) (D) Cooper, 1953 : 33.

THE PAGES (35°47'S, 138°17'E).

1972 colony known. (B) Stirling, 1972b : 8.

THISTLE I. (35°00'S, 136°08'E).

1802, Feb. seals on the beach. (D) Flinders, 1814 (1) : 133.

WALDEGRAVE I. (33°36'S, 134°49'E).

1802, Feb. a few hair seals killed. (D) Flinders, 1814 (1) : 123.

WARDANG I. (34°30'S, 137°21'E).

1972 small colony on nearby island. (D) Stirling, 1972b : 7.

WESTERN AUSTRALIA

BALD I. (34°55'S, 118°27'E).

1959, May one seen ashore. (D) Storr, 1965 : 196.

BOXER I. (34°00'S, 121°10'E).

1950, Nov. resting ashore. (C) Serventy, 1953 : 48.

BEAGLE I. (29°48'S, 114°53'E).

1963 100 (B) Ford, 1963 : 139.

CERVANTES IS. (30°31'S, 115°03'E).

1963 N and S islands frequented. (D) Ford, 1963 : 139.

CHEYNE'S BEACH (34°53'S, 118°23'E).

1959 common (D) Storr, 1965 : 196.

CHRISTMAS I. (38°41'S, 124°07'E).
1950, Nov. 65 on beach, and a number of harems. (A) Serventy 1953 : 48.

COMBE I. (34°05'S, 122°57'E).
1950, Nov. about 10 resting ashore. (C) Serventy, 1953 : 48.

DOUGLAS I. (34°10'S, 123°08'E).
1950, Nov. about 10, including 1 harem. (A) Serventy, 1953 : 48.

EASTER GROUP (28°41'S, 113°47'E).
1840, Apr. a few seals on Rat. I. (D) Stokes, 1846 (2) : 145.

ECLIPSE I. (35°11'S, 117°52'E).
1974 small numbers. (D) Marlow and King, 1974 : 126.

ESSEX ROCKS (30°24'S, 115°01'E).
1963 N rock regularly inhabited. (D) Ford, 1963 : 139.

FIGURE OF EIGHT I. (34°01'S, 121°36'E).
1950, Nov. 2, and about 20 on offlying rock. (C) Serventy, 1953 : 48.

FISHERMAN IS. (30°08'S, 114°57'E).
1963. 60 on N island. (B) Ford, 1963 : 139.

GOOSE I. (34°05'S, 123°11'E).
1802, Jan. a few hair seals. (D) Flinders, 1814 (1) : 89.
1803, May party sent to kill seals. Flinders, 1814 (1) : 265-6.
1950, Nov. dead seal in cave. Serventy, 1953 : 48.

LION I. (33°53'S, 122°01'E).
1956, Jan. 1 bull, 3 females, 1 pup. (B) Lindgren, 1956 : 101.

MIDDLE I. (34°07'S, 123°11'E).
1803, Jan. a few hair seals. (D) Flinders, 1814 (1) : 89.

MONDRAIN I. (34°08'S, 122°14'E).
1950, Nov. 5 ashore. (C) Serventy, 1953 ; 48.

PELSART GROUP (28°57'S, 113°56'E).
1727 survivors of the "Zeewyk" ate 147 seals in 10 months at Gun I. (van der Graeff). O'Loughlin, 1967 : 415.
1840 quantity of seal bones found in Gun I. Stokes, 1846 (2) : 150.
1840, Apr. a few seals on "Pylsart I." (D) Stokes, 1846 (2) : 138.
1966, Aug. 1 male, 1 female, 2 juveniles on Jubilee I. (D) O'Loughlin, 1967 : 415.

ROTTNEST I. (32°01'S, 115°31'E).
1803, Mar. a few seals. (Baudin) Cornell, 1974 : 512.
1822, Jan. a "great many" in bay at NE end; 3 killed, not of the fur species. (B) King, 1828 (2) : 163.

ROUND I. (34°12'S, 122°06'E).
1950, Nov. about 20, and at least 3 harems. (A) Serventy, 1953 : 48.

SALISBURY I. (34°21'S, 123°32'E).
1950, Nov. 20 ashore. (D) Serventy, 1953 : 48.

SANDLAND I. (30°12'S, 114°59'E).
1963 10, breeding colony. (A) Ford, 1963 : 139-40.

SEAL I. (35° 04'S 117°58'E)
1801, Dec. seals encountered. (D) Flinders, 1814 : 54.
1803, Feb. no seals. (Bandin) Cornell, 1974 : 485.
1818, Jan. several seals of the hairy species; 3 killed. (D) King 1828 (1) : 11, 19.
1821, Dec. seal killed in Oyster Harbour. King, 1828 (2) : 126.
1822, Jan. 5 seals killed. (D) King, 1828 (2) : 152.

SEAL I. (32°18'S 115° 42' E)
no evidence other than name. Storr, 1961 : 44.

TERMINATION I. (34°28'S, 122°02'E).
1950, Nov. about 20, including 1 harem. (A) Serventy, 1953 : 48.

THOMAS I. (33°58'S, 121°58'E).
1950, Nov. 1 seal ashore. (C) Serventy, 1953 : 48.

THUNDALDA (32°76'S, 126°00'E), below coastal cliffs
1973, Oct. 22 in cave, including bulls, females, pups and subadults. (A) Reilly and Johnstone, pers. comm.

WALLABI GROUP (28°24'S, 113°43'E).
1629 survivors of the "Batavia" named one of the Group "Seal or High I.", apparently because of the presence of seals. (Pelsaert). (D) Drake-Brockman, 1963 : 111 et seq.

WEDGE I. (34°06'S, 122°50'E).
1950, Nov. about 40 seals, and a number of harems. (A) Serventy, 1973 : 48.

APPENDIX F

Data on the distribution and status of the New Zealand Sea Lion, *Phocarctos hookeri*.

Known also as Hooker's sea lion, and to the early sealers as hair seal or tiger seal.

Key to status: A breeding known, C non-breeding,
B breeding probable, D status not known.

AUCKLAND IS. (50°50'S, 166°00'E), discovered 1806.

prior 1826	main period of sealing. McNab, 1909 : 344.
1830, Jan.	survey of coastline revealed not more than 20 hair seals. (D) Morell, 1832.
1864, Jan.	great numbers seen in Carnley's Harbour ... appears to be more numerous at Figure of Eight I. and at head of W arm of Carnley's Harbour. (A) Musgrave, 1865 :
1840	specimens collected, voyage of "Astralabe" and "Zelee". (Doumoutier, Hombron, Jacquinot). Clarke, 1873 : 750, 759.
1840	specimens collected, voyage of "Astralabe" and"Terror". Clarke, 1873 : 756.
1907	"quite numerous" at Enderby I., Carnley Harbour, Masked I. (A) Waite, 1909 : 543-8.
1971	more than 1000 at Sandy Bay, Enderby I. during breeding season. (A) Taylor, 1971.
1972/73	about 1000 at Enderby I., minimum of 2000 at Dundas I., 68 on Figure of Eight I., including at least 24 pups. (A) Best, 1974 : 2-3.
1974	total population at the islands estimated at 3000-3500. (A) Wilson, pers. comm.

SNARES IS. (48°00'S, 166°35'E), discovered 1791

1810-1817	4 marooned sealers lived on sea birds and seals; collected 1300 skins (most probably of fur seals, but possibly some sea lions as well. (D) McNab, 1909 : 223. (Note: fur seal flesh is quite unpalatable compared with sea lion. See Musgrave, 1865 : 22, 57).
1830, Jan.	no fur seals (or sea lions ?) found. Morell, 1832.
1907, Feb.	"quite numerous" at certain seasons; female with pup found. (A) Waite, 1909 : 544.
1948, Jan.-Feb.	less than 100, mostly males, at Boat Harbour. (B) Richdale (n.d.) : 112.
1961, 1967	small number of females in a predominantly male population. (B) (Knox) Crawley and Cameron, 1972 : 129.
1968/69	mother and pup seen on Main I., later near Boat Harbour with male. (A) Crawley and Cameron, 1972 : 130.
1970/71	mother and pup seen; summer population to maximum of 50. (A) Crawley and Cameron, 1972 : 128-32.

SOUTH I., NEW ZEALAND (north to 46°S).

1964	included within species range. King 1964 : 36.
1972	lone males haul out in winter, S of Dunedin. (Street) Gaskin, 1972 : 155.
1974	lone males haul out on S coast, to as far N as Otago Peninsula. Wilson, pers. comm.

STEWART I. (47°00'S, 168°00'E).

1972	a few males ashore in winter. (C) (Street) Gaskin, 1972 : 155.
1974, Feb.	group of 9 males at Small Crafts Retreat; lone males seen elsewhere. (C) Wilson, pers. comm.

CAMPBELL I. (52°32'S, 169°08'E).

prior 1864	sea lions taken for oil and skins. (D). Musgrave, 1865 : 18.
1909	"quite numerous" at certain seasons. (D) Waite, 1909 : 542.
1942-1947	a female with pup seen near Camp Core in most years; up to 150 males, mostly immature, at Northwest Bay; maximum of 20 females, minimum of 200 males on the island. (A) Bailey and Sorensen, 1962 : 52-4.
1948	minimum of 50 at Northwest Bay. (B) Sorensen, 1951 : 17.
1948	"considerable population, mainly non-breeding". (A) Falla, 1948 : 147.
1958, Feb.	main concentration at Northwest Bay, of 84 males, 5 females. (Street) (A) Bailey and Sorensen, 1962 : 55.

MACQUARIE I. (54°40'S, 158°50'E), discovered 1810.

1810/11	no evidence of occurrence. Csordas, 1963 : 32.
1949-1952	lone male "Blackie" recorded in all seasons. (C) Csordas, 1963 : 32.
1954	one or two seen chasing penguins. Csordas, 1963 : 33.
1955-1960	lone male "Mr. Brown" recorded each winter-spring, until mature. (C) Csordas, 1963 : 33-35.
1957-1959	a few other individuals seen, for only a day at a time. (C) Csordas, 1963 : 33.
1971, Nov.	lone, fully mature male near North Head. (C) Warneke, pers. obs.

APPENDIX G

Data on the distribution and status of the Southern Elephant Seal, *Mirounga leonina*, in the Australasian Region.

Key to status: A breeding known, C non-breeding,
B breeding probable, D status not known.

TASMANIA AND BASS STRAIT

HUNTER I. (40°30'S, 144°45'E).

1802, Dec.		"in large numbers on Barren (= Hunter) Island..." (Peron) (B) Cumpston, 1973 : 58.

KING I. (39°50'S, 144°00'E), discovered 1799.

1801		taking of elephant seals possibly begun by gang from the "Harrington". See footnote. Micco, 1971 : 12; Cumpston, 1968 : 36.
1802, Jan.		Elephant Bay named because of large numbers encountered. (Murray) (A) Lee 1915 : 117.
1802, Jan.		specimen of oil taken for Government, (Murray) Lee, 1915 : 118.
1802, Jan.		
1802, Apr.		1 killed at NE point. Flinders, 1814 (1) : 206.
1802, June		sealing gang landed at Elephant Bay from the "Margaret". Micco, 1971 ; 12.
1802, Dec.		the elephant seal oil industry described in detail by Peron, 1816 (2) : chap. XXII, XXIII. see translation in Micco, 1971.
1802, Dec.		"... they are becoming scarce already". Baudin to Governor King. HRNSW 5 : 832.

NEWS YEARS IS. (39°41'S, 143°51'E).

1801, Oct./Nov.		pioneer gang landed from the "Harrington". see footnote. Micco, 1971 : 12.
1802, Apr.		"Harrington" at New Years Islands. see footnote. Flinders, 1814 (1) : 209.
1802, Dec.		"in large numbers on ... New Years Ialands". (Peron) Cumpston, 1973 : 58.

SISTERS IS. (39°42'S, 147°57'E).

1802, Dec.		"... a few stragglers". (Peron) Cumpston, 1973 : 58.

WEST POINT, TASMANIA (40°56'S, 144°37'S).

1850-1330 ± 80 BP.		thousands of bones of young individuals in middens of aborigines. Jones, 1967 : 363.

Note: Stragglers occasionally haul out on the Tasmanian and Victorian coast (VIC:FWD) and some of the islands, e.g. Flinders I. (VIC:FWD), Lady Julia Percy I. (Simpson 1961: 277,307) and Seal Rocks (VIC:FWD). These records include both adult males and pregnant females.

NEW ZEALAND AND MAJOR ISLANDS, including Macquarie I.

ANTIPODES I. (49°41'S, 178°43'E).

1969, Feb. 35, North Cape to Leeward I. (Taylor) Sorensen, 1969b : 79.

AUCKLANDS IS. (50°50'S, 166°00'E).

1948 a regular visitor. Falla, 1948 : 142.

CAMPBELL I. (52°33'S, 169°08'E).

1870-1930 not recorded as breeding. (C) Falla, 1948,: 148.

1880-1929 no breeding seals ashore. (C) Sorensen, 1951 : 10.

1941 small breeding population of about 1000. (A) Sorensen, 1950

1944, Nov. 1100, including 26 bulls and 105 pups. (A) Bailey and Sorensen, 1962 : 74.

1947 breeding census showed 15 harems including 32 bulls, 194 cows and 191 pups (Sorensen) (A) Bailey and Sorensen, 1962 : 68.

1957, Oct. 16 bulls, 211 females and 190 pups. (A) (Thompson) Bailey and Sorensen, 1962 ;

1958 post breeding haul out of 84 large bulls, 129 medium bulls, 281 females and 42 pups. (Street) Bailey and Sorensen, 1962 : 74.

CHATHAM I. (44°50'S, 176°30'W).

1974 stragglers only.(C) Wilson, pers. comm.

MACQUARIE I. (54°40'S, 158°50'E).

c.1814-1919. elephant seals taken for oil, initially by gangs from Sydney, later from New Zealand. (A) Cumpston, 1968 : 36 et seq

1920, Feb. license cancelled by Tasmanian Government. Cumpston, 1968 : 316.

1949 population stable in numbers. (A) Nicholls, 1970 : 599.

1952-1958 counts made which indicate population stabilized at natural level: 33000 breeding cows, 28500 weaned pups, and 3000 beach-masters and challengers. (A) Carrick and Ingham, 1960 : 336.

1972 review of population dynamics, and of research on growth and development.

1960 provisional total population of 110,000, including pups; breeding population of 36000-37000 females and 3350-4000 males. (A) Carrick and Ingham, 1962c : 200-1.

SNARES IS. (48°00'S, 166°35'E).

1948 suitable beaches available only at Boat Harbour, room for 5. (D) Falla, 1948 : 137.

1948, Jan-Feb. fighting among large males; no estimate of numbers. Richdale (n.d.) : 111-12.

SOUTH I., NEW ZEALAND (north to 41°30'S).

1974 a few stragglers haul out; records to as far N as Wellington. Wilson, pers. comm.

1969 isolated records of females pupping on shore. (C) Sorenson, 1969a : 6.

MINISTRY FOR CONSERVATION

Fisheries and Wildlife Division

632 Bourke Street, Melbourne, Vic. 3000
Telephone No.: 67 7753 (Area Code 03)
Telegrams: Fishwild Melbourne
Address all letters to the Secretary

Your Ref. :
Our Ref. : RMW 74171:MQ
If telephoning or calling, please ask for

ARTHUR RYLAH INSTITUTE FOR ENVIRONMENTAL RESEARCH
Brown Street, Heidelberg. Vic. 3084.
Telephone: 459 2900.

7th August, 1974.

Mr. H. B. Shugg,
Chief Warden of Fauna,
Dept. of Fisheries & Fauna,
108 Adelaide Terrace,
PERTH. W.A. 6000.

Dear Harry,

Thank you for your summary of the situation re. seals in Western Australia.

When you say that most of the known seal and sea lion are reserved, I take it that your Department does know which islands are inhabited by seals, even if the exact status of the breeding colonies has not been determined. It would be a great help if you or Alan Burbidge could provide me with a list of localities frequented by fur seals and one for sea lions; this at least would give me a much better appreciation of distribution than can be gained from the literature.

Again, if it is at all possible, I should like to know which colonies of fur seals and sea lions are regarded as the most important reservoirs of the two species in Western Australia.

With best wishes,

Bob

ROBERT M. WARNEKE,
Senior Research Officer

Dr Burbidge A.A.B.

MINISTRY FOR CONSERVATION

Fisheries and Wildlife Division

632 Bourke Street, Melbourne, Vic. 3000
Telephone No.: 67 7753 (Area Code 03)
Telegrams: Fishwild Melbourne
Address all letters to the Secretary

Your Ref. :
Our Ref. : RMW 74245
If telephoning or calling, please ask for

ARTHUR RYLAH INSTITUTE FOR ENVIRONMENTAL RESEARCH,
123 Brown Street, Heidelberg. Vic. 3084.
Telephone: 459 2900

5th December, 1974.

Mr. Harry Shugg,
Chief Warden of Fauna,
Department of Fisheries and Fauna,
108 Adelaide Terrace,
PERTH, W.A. 6000

Dear Harry,

Herewith for your information a copy of the report on seals in Australian and New Zealand waters, to which you contributed information in your letter 81/38, 29 July 1974.

I would appreciate it very much if you could have someone on your staff examine critically the sections dealing with Western Australia for errors and omissions. One serious deficiency is the lack of information on the protection of the islands on which seals occur. If possible I would like to have specific comment on each locality that I have listed as to whether it is a nature reserve or whatever. It would also be of great assistance to me if I could have a copy of any Acts, Regulations and information brochures relating to the protection of seals and/or the islands occupied by them.

Finally, can you tell me when seals were first protected in Western Australia.

With best wishes,

ROBERT M. WARNEKE
Senior Research Officer

R/O

There has been pp on this - possibly on Seals file

25/6/2

XXXX WILDLIFE

Mr. R. Warneke,
Arthur Rylah Institute of Environmental Research,
Brown Street,
HEIDELBERT, VIC. 3084

Dear Bob,

Harry Shugg has passed on to me a copy of your report on Seals. I also have a copy of your letter to Harry of August 7 last year requesting information on seal distribution.

Attached are some notes I have written on the report - most of them concera the status of the various islands. As you can see most islands known to be used by seals in W.A. are reserved.

As you know nobody in W.A. actively works on seals. I know of a few people who have an interest and there is probably a lot of anecdotal information around which might be collated by someone if they had the time and inclination. It is unlikely that anyone in my Department would have the time to do it at present. Seals do not really present a great conservation problem here compared with many other species.

I will return your letter and the report to Harry Shugg for him to forward information relating to the Fauna laws, etc.

Regards.

A.

Andrew A. Burbidge
Officer in Charge
January 24, 1975.

SEALS REPORT - R. Warneke

p 4 *Neophoca cinerea* local information is that occasionally seen in Shark Bay. I have seen them at the mouth of the Murchison River.

App A - Abbreviations now W.A. Department of Fisheries and Wildlife.

Arctocephalus forsteri - W.A.

Boxer I.	- part Reserve A 22796 - Cons of Flora and Fauna vested in the W.A. Wild Life Authority.
Capps I.	- ditto
Christmas I.	- The official name of this island is DAW - should read DAW I. - also known as Christmas I. - ditto for reserve.
Eclipse I.	- Lighthouse site - controlled by Commonwealth Govt.
Figure of Eight I.	part Reserve A 22796
Hood I.	- ditto
Middle I.	- ditto
Mondrain I.	- ditto
Round I.	- ditto
Salisbury I.	- ditto
Seal Rock	- ditto
Termination I.	- ditto
Wedge I.	- Official name KERMADEC I. Should read - Kermadec I. - also known as Wedge I. - ditto

Add to these

Bald I. (D) Reserve A 25869 Conservation of Flora and Fauna, vested W.A. Wild Life Authority seen October, 1971 G. Smith and A. Burbidge, approx. 30 animals both on main island and adjacent islets.

Neophoca inerea - W.A.

Bald I.	- Reserve A 25869, Cons. of Flora and Fauna vested W.A. Wild Life Authority. add October 1971 G. Smith and A. Burbidge approx. 15 both on main island and adjacent islets.
Boxer I.	- See above
Beagle I.	- should read Beagle Is. Reserve 26411, Cons. of Flora and Fauna, vested W.A. Wildlife Authority.
Cervantes I.	- Reserve 29253, Cosn. of Fauna, vested W.A. Wildlife Authority.
Christmas I.	- Actually DAW I. see above.
Combe I.	- Official name WESTALL I. part Reserve A 22796
Douglas I.	- Part Reserve A 22796.
Easter Group	- Part Reserve A 20253, Conservation of Flora and Fauna, Tourism and purposes associated with the fishing industry, vested in Minister for Fisheries and Wildlife.
Eclipse I.	- Controlled by Commonwealth - lighthouse site.
Essex Rocks	- Reserve 29257. Conservation of Flora and Fauna vested in W.A. Wildlife Authority.

Figure of Eight I.	- part Reserve A 22796.
Fisherman I.	- Reserve 29256, Cons of Fauna, vested W.A. Wildlife Authority.
Goose I.	- part Reserve A 22796
Lion I.	- part Reserve A 22796
Middle I.	- ditto
Mondrain I.	- ditto
Pelsart Group	- actually correctly known as Southern Group. Part Reserve A 20253.
Rottnest I.	- Reserve A 16713, Recreation.
Round I.	- Part Reserve A 22796
Salisbury I.	- ditto
Sandland I.	- Reserve 29255, Cons of Fauna, vested W.A. Wild Life Authority.
Seal I.	- Reserve A 25645, Cons of Fauna, vested W.A. Wild Life Authority.
Seal I. (Safety Bay)	Reserve 24204, Cons of Flora and Fauna, vested W.A. Wild Life Authority.
Termination I.	- Part Reserve A 22796.
Thomas I.	- ditto
Wallabi Group	- part A20253.
Wedge I.	- Officially KERMADEC, see above part Reserve A 22796.

Add to above

Carnac Island (32°08'S, 115°39'E) Commonly seen on the island, one to eighteen individuals over the past 6 years, not breeding.

Dyers Island off Rottnest I., common, no numbers known.

This species very occasionally frequents mainland beaches in the Metropolitan area.

Mr. R. M. Warneke,
Senior Research Officer,
Arthur Rylah Institute for
Environmental Research,
123 Brown Street,
HEIDELBERG VICTORIA 3084.

RMW 74245
81/38

February 25, 1975

Dear Bob,

You would by now have Andrew Burbidge's letter of January 24. I'm sorry that we've taken so long but the amount of paper that has to be processed weighs us down!

We do not have copies of W.A. Statutes as some departments have, but the State Library (which incorporates State Archives) informed me that seals were first protected here under the Game Act 1892.

The Game Acts of 1912-13 list them as protected "from the beginning of November to the end of March in every year". This protection applied until the Fauna Protection Act, 1950, (as it then was) was proclaimed on July 1, 1952.

Since July 1, 1952, all seals have been protected everywhere in Western Australia.

Kindest regards,

(H.B. Shugg)
CHIEF WARDEN OF FAUNA